Another summer and another edition of the Copa América! Along with the  
Africa Cup of Nations, Nations League finals, the Women’s World Cup,  
Under-21 European Championship AND the Gold Cup this is yet another  
soccer-filled season after last year’s World Cup and the Asian Cup  
earlier this year (I also did a blog post on these last two tournaments  
which you can see [here (World  
Cup)](https://ryo-n7.github.io/2018-06-29-visualize-worldcup/) and [here  
(Asian Cup)](https://ryo-n7.github.io/2019-01-11-visualize-asian-cup/)).  
There is so much football going on at once even I can’t keep up,  
especially with the time difference! To not redo all the previous  
visualizations with Copa América data I tried to find new sources of  
data and other forms of visualizations to give some insight into the  
players and teams competing to be the champion of South America. You can  
find all the code I used in this blogpost here and you can also find  
other soccer related data viz in my  
[soccer\_ggplot](https://github.com/Ryo-N7/soccer_ggplots) Github repo.

The sections will go from a very macro-level view of the **historical  
records** of the tournament, to the **squads** competing, the teams’  
**match record** in the Copa América, and finally to a micro-level view  
of various attacking players using **xG** statistics.

¡Vámonos!

**Packages**

library(dplyr) ## data wrangling

library(tidyr) ## data wrangling

library(purrr) ## data wrangling and iteration

library(stringr) ## data wrangling

library(rvest) ## webscraping

library(polite) ## webscraping (Github only pkg)

library(ggplot2) ## plotting

library(scales) ## plotting scales

library(ggimage) ## images for flags

library(ggforce) ## plotting text labels

library(cowplot) ## plotting grid

library(glue) ## text

library(ggrepel) ## plotting text labels

library(magick) ## plotting

library(kable) ## tables

library(ggtextures) ## soccer ball emoji as geom\_col()

library(extrafont) ## fonts: Roboto Condensed

loadfonts()

**theme\_copaAmerica**

I wanted to have all the plots in this blogpost to have a consistent  
color theme. As the tournament is going to be held in Brazil, I went  
with a color theme based on its flag with blue, yellow, and green being  
the primary colors.

theme\_copaAmerica <- function(

title.size = 24,

subtitle.size = 14,

caption.size = 8,

axis.text.size = 14,

axis.text.x.size = 12,

axis.text.y.size = 12,

axis.title.size = 16,

strip.text.size = 18,

panel.grid.major.x = element\_line(size = 0.5, color = "white"),

panel.grid.major.y = element\_line(size = 0.5, color = "white"),

panel.grid.minor.x = element\_blank(),

panel.grid.minor.y = element\_blank(),

axis.ticks = element\_line(color = "white")) {

## Theme:

theme(text = element\_text(family = "Roboto Condensed", color = "white"),

plot.title = element\_text(family = "Roboto Condensed", face = "bold",

size = title.size, color = "yellow"),

plot.subtitle = element\_text(size = subtitle.size),

plot.caption = element\_text(size = caption.size),

panel.background = element\_rect(fill = "#009b3a"),

plot.background = element\_rect(fill = "#002776"),

axis.text = element\_text(size = axis.text.size, color = "white"),

axis.text.x = element\_text(size = axis.text.x.size, color = "white"),

axis.text.y = element\_text(size = axis.text.y.size, color = "white"),

axis.title = element\_text(size = axis.title.size),

axis.line.x = element\_blank(),

axis.line.y = element\_blank(),

panel.grid.major.x = panel.grid.major.x,

panel.grid.major.y = panel.grid.major.y,

panel.grid.minor.x = panel.grid.minor.x,

panel.grid.minor.y = panel.grid.minor.y,

strip.text = element\_text(color = "yellow", face = "bold",

size = strip.text.size,

margin = margin(4.4, 4.4, 4.4, 4.4)),

strip.background = element\_blank(),

axis.ticks = axis.ticks

)

}

**Top Goal Scorers // Goleadores**

For this plot I took the stats from the Spanish version of the Wikipedia  
page as it had more content. I used purrr::flatten\_df() to squish the  
list output into a dataframe then set the names of each column using  
purrr::set\_names().

url <- "https://es.wikipedia.org/wiki/Anexo:Estad%C3%ADsticas\_de\_la\_Copa\_Am%C3%A9rica"

session <- bow(url)

copa\_top\_scorers <- scrape(session) %>%

html\_nodes(".mw-parser-output > table:nth-child(95)") %>%

html\_table() %>%

flatten\_df() %>%

set\_names(c("player", "country", "goals")) %>%

mutate(image = "https://www.emoji.co.uk/files/microsoft-emojis/activity-windows10/8356-soccer-ball.png")

glimpse(copa\_top\_scorers)

## Observations: 22

## Variables: 4

## $ player "Norberto Méndez", "Zizinho", "Lolo Fernández", "Sever...

## $ country "ARG Argentina", "BRA Brasil", "PER Perú", "URU Urugua...

## $ goals 17, 17, 15, 15, 13, 13, 13, 13, 13, 12, 12, 11, 11, 11...

## $ image "https://www.emoji.co.uk/files/microsoft-emojis/activi...

Like in the Asian Cup blogpost I use [Claus  
Wilke](https://twitter.com/ClausWilke/)’s  
[ggtextures](https://github.com/clauswilke/ggtextures) package to use  
**soccer ball emoji** as the column image in the plot.

copa\_goleadores\_raw\_plot <- copa\_top\_scorers %>%

head(5) %>%

ggplot(aes(x = reorder(player, goals), y = goals,

image = image)) +

geom\_isotype\_col(img\_width = grid::unit(1, "native"), img\_height = NULL,

ncol = NA, nrow = 1, hjust = 0, vjust = 0.5) +

geom\_text(aes(label = goals, family = "Roboto Condensed", fontface = "bold"),

size = 7.5, color = "yellow",

nudge\_y = 0.5) +

coord\_flip() +

scale\_y\_continuous(breaks = c(0, 2, 4, 6, 8, 10, 12, 14, 16, 18),

expand = c(0, 0),

limits = c(0, 19)) +

labs(title = "Top Scorers of the Copa América",

subtitle = glue("

Most goals in a single tournament: 9

Humberto Maschio (Argentina), Javier Ambrois (Uruguay), Jair (Brazil)"),

y = "Number of Goals", x = NULL,

caption = glue("

Source: Wikipedia

By @R\_by\_Ryo")) +

theme\_copaAmerica(title.size = 26,

subtitle.size = 16,

caption.size = 12,

axis.text.size = 18,

axis.title.size = 18,

panel.grid.major.y = element\_blank(),

axis.ticks = element\_blank())

## Add flags to y-axis:

axis\_image <- axis\_canvas(copa\_goleadores\_raw\_plot, axis = 'y') +

draw\_image("https://upload.wikimedia.org/wikipedia/en/0/05/Flag\_of\_Brazil.svg",

y = 16.5, scale = 1.8) +

draw\_image("https://upload.wikimedia.org/wikipedia/commons/1/1a/Flag\_of\_Argentina.svg",

y = 12.5, scale = 1.8) +

draw\_image("https://upload.wikimedia.org/wikipedia/commons/f/fe/Flag\_of\_Uruguay.svg",

y = 9, scale = 1.8) +

draw\_image("https://upload.wikimedia.org/wikipedia/commons/d/df/Flag\_of\_Peru\_%28state%29.svg",

y = 5.25, scale = 1.8) +

draw\_image("https://upload.wikimedia.org/wikipedia/en/0/05/Flag\_of\_Brazil.svg",

y = 1.5, scale = 1.8)

copa\_goleadores\_plot <- ggdraw(insert\_yaxis\_grob(copa\_goleadores\_raw\_plot, axis\_image, position = "left"))

copa\_goleadores\_plot

Most of these players aren’t ones you might recognize. The Copa América  
used to be held a lot more regularly (and sometimes erratically) until  
this century so players had a lot more opportunities to score goals. All  
five of the players you see here played in the 1930s-1950s when there  
was a tournament every one or two years. Out of currently active  
players, Peruvian legend Paolo Guerrero has 11 goals along with Eduardo  
Vargas (from Chile) with 10. (Edit: after the Chile – Japan game, Vargas is on  
12…) Another player you might recognize that was actually tied with  
Ademir for 5th place, along with three other players, was Gabriel  
Batistuta (“Batigol”).

**Winners of the Copa América**

After grabbing the data from the Wikipedia page I used a variety of  
functions to clean and reshape the dataset like tidyr::separate() to  
split the number of occurences and the year.

url <- "https://es.wikipedia.org/wiki/Anexo:Estad%C3%ADsticas\_de\_la\_Copa\_Am%C3%A9rica"

session <- bow(url)

copa\_campeones <- scrape(session) %>%

html\_nodes(".mw-parser-output > table:nth-child(10)") %>%

html\_table() %>%

flatten\_df()

copa\_campeones\_limpia <- copa\_campeones %>%

janitor::clean\_names() %>%

slice(1:8) %>%

select(1:4) %>%

set\_names(c("team", "winners", "runners\_up", "third\_place")) %>%

separate(winners, into = c("Champions", "first\_place\_year"),

sep = " ", extra = "merge") %>%

separate(runners\_up, into = c("Runners-up", "second\_place\_year"),

sep = " ", extra = "merge") %>%

separate(third\_place, into = c("Third Place", "third\_place\_year"),

sep = " ", extra = "merge") %>%

mutate\_all(list(~str\_replace\_all(., "–", "0"))) %>%

mutate\_at(vars(contains("num")), funs(as.numeric)) %>%

gather(key = "key", value = "value", -team,

-first\_place\_year, -second\_place\_year, -third\_place\_year) %>%

mutate(key = as.factor(key),

value = as.numeric(value),

team = team %>% str\_replace(., "[A-Z]{3}", "") %>% str\_trim(.),

team = case\_when(team == "Brasil" ~ "Brazil",

TRUE ~ team)) %>%

mutate(key = forcats::fct\_relevel(key,

"Champions",

"Runners-up",

"Third Place")) %>%

arrange(key, desc(value)) %>%

mutate(team = forcats::as\_factor(team),

order = row\_number())

I also wanted to add flags to this plot but  
cowplot::insert\_yaxis\_grob() is unfortunately not compatible with  
facets. I used stringr::str\_wrap() to format the subtitle nicely while  
I used glue::glue() to avoid having the use ‘\n’ to create a new line  
for the caption.

copa\_ganadores\_plot <- copa\_campeones\_limpia %>%

ggplot(aes(value, forcats::fct\_rev(team), color = key)) +

geom\_point(size = 10) + # 10

geom\_text(aes(label = value),

size = 5, color = "black", # 5

family = "Roboto Condensed", fontface = "bold") +

scale\_color\_manual(values = c("Champions" = "#FFCC33",

"Runners-up" = "#999999",

"Third Place" = "#CC6600"),

guide = FALSE) +

scale\_x\_continuous(breaks = c(1, 5, 10, 15),

labels = c(1, 5, 10, 15),

limits = c(-1, 16)) +

labs(x = "Number of Occurrence", y = NULL,

title = "Most Successful Teams of the Copa América!",

subtitle = str\_wrap("Ordered by number of Copa América(s) won. Argentina missed the chance to leapfrog Uruguay after consecutive final losses in the previous two tournaments!", width = 80),

caption = glue("

Source: Wikipedia

By @R\_by\_Ryo")) +

facet\_wrap(~key) +

theme\_copaAmerica(subtitle.size = 14,

caption.size = 10)

copa\_ganadores\_plot

What’s surprising to note is that Pele never won a Copa América with  
Brazil, although he did get Best Player and Top Scorer in the 1959  
edition of the tournament. Even more bizarrely Diego Maradona has never  
won it either! He didn’t play in either of the 1991 and 1993 editions  
where Argentina won their 13th and 14th Copas.

**Copa América Squad Profiles**

We just looked at what happened in the past but who are the players  
competing in the tournament this year? To take a quick look I  
web-scraped the squads of each of the competing teams from Wikipedia.

I created a list of the xpaths for each of squads and using  
purrr::map() I grabbed the data for each participating country. After  
I got some meta-information about the country name and the group I  
created a list-column that stores the squad data as a dataframe in its  
own column. To explode this out I used tidyr::unnest() to reshape the  
entire dataframe to have one row with all the data for each player in  
every squad.

To get a clean dataset I use some stringr::str\_\*() functions to  
properly format the character strings such as the player positions,  
ages, date of births.

squads\_df\_clean <- squads\_df\_raw %>%

janitor::clean\_names() %>%

select(-delete, squad\_num = no,

position = pos, birth\_age = date\_of\_birth\_age) %>%

mutate(position = position %>% str\_replace\_all(., "[1-9]", ""),

birth\_age = birth\_age %>% str\_extract\_all(., pattern = "\\([^()]+\\)")) %>% unnest(birth\_age) %>%

group\_by(player) %>%

mutate(colnum = seq\_along(player)) %>%

spread(key = colnum, value = birth\_age) %>%

ungroup() %>%

select(everything(), dob = `1`, age = `2`) %>%

mutate(dob = dob %>% str\_replace\_all(., "[()]", "") %>% lubridate::as\_date(),

age = age %>% str\_extract(., "[0-9]+") %>% as.integer,

country = forcats::fct\_relevel(country,

"Brazil", "Argentina", "Uruguay",

"Peru", "Qatar", "Chile",

"Venezuela", "Paraguay", "Japan",

"Bolivia", "Colombia", "Ecuador",

),

club = case\_when(

club == "Barcelona" & country == "Ecuador" ~ "Barcelona (Ecuador)",

TRUE ~ club))

glimpse(squads\_df\_clean)

## Observations: 276

## Variables: 12

## $ name 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,...

## $ group "A", "A", "A", "A", "A", "A", "A", "A", "A", "A...

## $ country Brazil, Brazil, Brazil, Brazil, Brazil, Brazil,...

## $ squad\_num 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, ...

## $ position "GK", "DF", "DF", "DF", "MF", "DF", "FW", "MF",...

## $ player "Alisson", "Thiago Silva", "Miranda", "Marquinh...

## $ caps 36, 79, 57, 36, 36, 40, 3, 10, 29, 65, 49, 15, ...

## $ goals 0, 7, 3, 1, 0, 2, 1, 0, 16, 8, 14, 1, 7, 0, 0, ...

## $ club "Liverpool", "Paris Saint-Germain", "Internazio...

## $ country\_league "England", "France", "Italy", "France", "Spain"...

## $ dob 1992-10-02, 1984-09-22, 1984-09-07, 1994-05-14...

## $ age 26, 34, 34, 25, 27, 33, 22, 22, 22, 30, 27, 28,...

**Age-histogram**

Using this data I can plot a bunch of histograms:

age\_country\_plot <- squads\_df\_clean %>%

group\_by(country) %>%

mutate(median\_age = median(age)) %>%

ungroup() %>%

ggplot(aes(x = age)) +

geom\_histogram(fill = "red", binwidth = 1) +

geom\_vline(aes(xintercept = median\_age), size = 1.2) +

geom\_label(aes(x = median\_age, y = 8,

label = glue::glue("Median: {median\_age}")),

nudge\_x = 0.5, hjust = 0.1, size = 3,

family = "Roboto Condensed", color = "black") +

labs(title = "Age Distribution of Copa América squads",

subtitle = "Columns ordered Group A to Group C",

x = "Age", y = NULL,

caption = glue::glue("

Source: Wikipedia

By: @R\_by\_Ryo")) +

scale\_x\_continuous(expand = c(0, 0)) +

scale\_y\_continuous(expand = c(0, 0),

breaks = scales::pretty\_breaks()) +

theme\_copaAmerica(title.size = 22,

subtitle.size = 14,

caption.size = 8,

axis.text.size = 12,

axis.title.size = 16,

strip.text.size = 18,

panel.grid.minor.x = element\_line(color = "white"),

panel.grid.minor.y = element\_line(color = "white")) +

facet\_wrap(~country, ncol = 3)

age\_country\_plot

In terms of age, Japan have the youngest team with a median of 21, 4  
years younger than the next youngest team, Qatar. The rest have a fairly  
balanced spread of ages from 20 to early-mid 30s with most of the  
medians hovering around 27 years of age. The reason for Japan’s  
extremely young squad is due to the fact that the full-strength Japan  
team has played in both the World Cup and the Asian Cup in the past  
year. Along with the fact that the Tokyo Olympics are next year, it was  
decided to use the invitation to the Copa América as a trial-by-fire for  
the young stars of the future. Much like in a real Olympic squad, the  
team contains three “overage” players in World Cup 2010/2014/2018  
goalkeeper Eiji Kawashima, Premier League winner Shinji Okazaki, and  
Getafe playmaker Gaku Shibasaki.

The oldest player will be Brazil captain Dani Alves at 36 with  
Paraguay’s Oscar Cardozo only two weeks younger. On the other hand, the  
youngest player is Japan’s 18-year old prodigy Takefusa Kubo, the  
ex-Barcelona youth player who only just recently moved to Real Madrid!  
In light of his transfer a lot of eyes will be on him to see if he can  
produce some Captain Tsubasa-esque performances for a very inexperienced  
Japan team gearing up for the Tokyo Olympics!

**Caps histogram**

When considering the experience of a squad it’s not enough to look at  
ages but one needs to look at the caps or appearances for the national  
team as well.

caps\_country\_plot <- squads\_df\_clean %>%

group\_by(country) %>%

mutate(median\_cap = median(caps)) %>%

ungroup() %>%

ggplot(aes(x = caps)) +

geom\_histogram(fill = "red", binwidth = 5) +

geom\_vline(aes(xintercept = median\_cap), size = 1.25) +

geom\_label(aes(x = median\_cap, y = 15,

label = glue::glue("Median: {median\_cap}")),

nudge\_x = 0.5, hjust = 0.05, size = 3,

family = "Roboto Condensed", color = "black") +

labs(title = "Caps (Appearances) by Country",

subtitle = "Columns ordered Group A to Group C",

x = "Caps", y = NULL,

caption = glue::glue("

Source: Wikipedia

By: @R\_by\_Ryo")) +

scale\_x\_continuous(expand = c(0, 0)) +

scale\_y\_continuous(expand = c(0, 0)) +

theme\_copaAmerica(

title.size = 20,

subtitle.size = 14,

caption.size = 10,

axis.text.size = 10,

axis.title.size = 16,

strip.text.size = 18,

panel.grid.major.x = element\_line(color = "white", size = 0.25),

panel.grid.major.y = element\_line(color = "white", size = 0.25),

panel.grid.minor.x = element\_line(color = "white", size = 0.25),

panel.grid.minor.y = element\_line(color = "white", size = 0.25)) +

facet\_wrap(~country, ncol = 3)

caps\_country\_plot

The majority of Japan’s squad have 0 (ZERO) caps, with the  
aforementioned three “overage” players taking up most of the proportion  
of caps on the team. Bolivia are also taking a untested squad with 8 of  
their players with 2 caps or less! Chile, Uruguay, and Argentina bring  
their veterans with multiple players over or around 100 caps. From this  
data I was surprised that Jefferson Farfan and Paolo Guerrero didn’t  
have 100 caps by now…

The player with the most caps is Lionel Messi (130) followed closely by  
Diego Godin (126), and Alexis Sanchez (124). On the other hand there are  
29 players hopeful of making their first national team appearance at  
this tournament with the majority (17 players) coming from Japan.

**Goal distribution**

Next I looked at the distribution of goals scored by the midfielders and  
strikers of each team. I found out about using  
ggplot2::position\_nudge() for slightly adjusting variables on a  
discrete scale in similar fashion to the nudge\_y = and nudge\_x =  
arguments most people might be familiar with from other geoms. I also  
used ggforce::geom\_mark\_hull() to do some labelling.

goals\_country\_plot <- squads\_df\_clean %>%

filter(position %in% c("MF", "FW")) %>%

group\_by(country) %>%

mutate(median = median(goals)) %>%

ungroup() %>%

ggplot(aes(x = goals, y = reorder(country, median))) +

ggridges::geom\_density\_ridges(fill = "red", color = "white", scale = 1.1) +

geom\_point(aes(x = median, y = country), position = position\_nudge(y = 0.25),

color = "yellow", size = 3) +

ggforce::geom\_mark\_hull(aes(filter = country == "Argentina" & goals == 67, label = "Lionel Messi: 67 goals"),

label.buffer = unit(15, "mm"), label.fontsize = 10, label.fill = "red",

label.family = "Roboto Condensed", label.colour = "white",

con.cap = unit(1, "mm"), con.type = "straight") +

ggforce::geom\_mark\_hull(aes(filter = country == "Uruguay" & goals == 55, label = "Luis Suarez: 55 goals"),

label.buffer = unit(5, "mm"), label.fontsize = 10, label.fill = "red",

label.family = "Roboto Condensed", label.colour = "white",

con.cap = unit(1, "mm"), con.type = "straight") +

ggforce::geom\_mark\_hull(aes(filter = country == "Japan" & goals == 50, label = "Shinji Okazaki: 50 goals"),

label.buffer = unit(2, "mm"), label.fontsize = 10, label.fill = "red",

label.family = "Roboto Condensed", label.colour = "white",

con.cap = unit(1, "mm"), con.type = "straight") +

ggforce::geom\_mark\_hull(aes(filter = country == "Uruguay" & goals == 46, label = "Edinson Cavani: 46 goals"),

label.buffer = unit(25, "mm"), label.fontsize = 10, label.fill = "red",

label.family = "Roboto Condensed", label.colour = "white",

con.cap = unit(1, "mm"), con.type = "straight") +

ggforce::geom\_mark\_hull(aes(filter = country == "Chile" & goals == 41, label = "Alexis Sanchez: 41 goals"),

label.buffer = unit(4, "mm"), label.fontsize = 10, label.fill = "red",

label.family = "Roboto Condensed", label.colour = "white",

con.cap = unit(1, "mm"), con.type = "straight") +

scale\_x\_continuous(limits = c(0, 73),

expand = c(0.01, 0.01),

breaks = c(0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70),

labels = c(0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70)) +

expand\_limits(y = 13.5) +

labs(title = "Distribution of Goals Scored by Midfielders and Strikers",

subtitle = "Copa América 2019 squads, Yellow dot = Median goals",

x = "Goals", y = NULL,

caption = glue::glue("

Source: Wikipedia

Data from prior to start of tournament

By: @R\_by\_Ryo")) +

theme\_copaAmerica(title.size = 18,

subtitle.size = 12,

caption.size = 8,

axis.text.size = 14,

axis.title.size = 16,

strip.text.size = 18)

goals\_country\_plot

With a lot of these players being more defensively minded or new players  
the distribution is heavily skewed but you can see little mounds showing  
the top goalscorers for each country and see which countries have their  
goalscorers spread out among multiple players such as Brazil, Qatar, and  
Peru.

If you know your South American players you can take a good guess at who  
are the top goal scorers for each nation. For Colombia the two outlying  
mounds are obviously James Rodriguez and Falcao, for example.  
Venezuela’s top scorer with 22 is Salomon Rondon and for Brazil, if not  
for his injury, a lonesome mound would have appeared for Neymar with 60  
goals!

**Player contribution by league**

Now let’s check the player contribution to the squads at the Copa  
América by league. I’m just going to use the country that the league is  
from for simplicity’s sake. Originally I wanted to left\_join() it with  
a ‘country <> domestic league’ table but couldn’t find one and the  
league names itself aren’t very meaningful or have awful sponsor names  
that obfuscate the country of origin even further.

player\_contrib\_league\_plot <- squads\_df\_clean %>%

group\_by(country\_league) %>%

summarize(n = n()) %>%

ungroup() %>%

ggplot(aes(y = n, x = reorder(country\_league, n))) +

geom\_col(fill = "red") +

geom\_text(aes(label = n, family = "Roboto Condensed", fontface = "bold"),

size = 4.5, color = "yellow",

nudge\_y = 0.5) +

coord\_flip() +

scale\_y\_continuous(labels = c(0, 5, 10, 15, 20, 25),

breaks = c(0, 5, 10, 15, 20, 25),

limits = c(0, 30),

expand = c(0, 0)) +

labs(title = "Breakdown of Player Contributions by League",

subtitle = glue("

Shown as Country Name

Mexico (Liga MX) contributed 27 players to South American squads"),

x = "League (Country name)", y = "Number of players",

caption = glue::glue("

Source: Wikipedia

By: @R\_by\_Ryo")) +

theme\_copaAmerica(title.size = 18,

subtitle.size = 12,

caption.size = 10,

axis.text.size = 14,

axis.text.y.size = 11,

axis.title.size = 16,

panel.grid.major.y = element\_blank(),

panel.grid.minor.x = element\_line(color = "white"))

player\_contrib\_league\_plot

The best of the best players from South American countries will move on  
to Europe so the Argentinean league (Superliga Argentina) and the  
Brazilian league (Brasileirão – Serie A) do not have as many players as  
you might think and as a consequence, the top leagues of England, Spain,  
and Italy contribute quite a bit! A lot of the better players but not  
quite elite South American players might go to Mexico instead of a  
lower-mid European league. With the growth of the MLS a fair number of  
players ply their trade there as well.

We can take a more detailed look by creating a table of the proportion  
of players from each squad coming from either a domestic league or any  
other league. I had to do a lot of wrangling to get the proper output  
for the table. After calculating the percentage of domestic players from  
a country’s domestic league I added the full data back in. Then I had to  
make sure that for each country, the country – domestic league country  
was the first row in each of the country groups (so Bolivia – Bolivia,  
Bolivia, China, Japan – Japan, Japan – England, etc.). By doing this I  
can automatically tidyr::fill()-in the rest of the rows of that  
country with the ‘percentage of players from domestic league stat’.

squads\_df\_clean %>%

group\_by(country, country\_league) %>%

summarize(player\_from\_league = n()) %>%

filter(country == country\_league) %>%

mutate(perc\_from\_domestic\_league = percent(player\_from\_league / 23, accuracy = 0.1)) %>%

right\_join(squads\_df\_clean %>%

group\_by(country, country\_league) %>%

summarize(player\_from\_league = n()) %>%

ungroup()) %>%

mutate(first = case\_when(

country == country\_league ~ 1,

TRUE ~ 0)) %>%

arrange(country, desc(first)) %>%

fill(perc\_from\_domestic\_league) %>%

group\_by(country) %>%

mutate(perc\_from\_league = percent(player\_from\_league / 23, accuracy = 0.1),

country\_league = glue::glue("{country\_league} - league")) %>%

arrange(desc(player\_from\_league)) %>%

select(Country = country, `League (country name)` = country\_league,

`Number of players from league` = player\_from\_league,

`Percentage of players from league` = perc\_from\_league,

`Percentage of players from domestic league` = perc\_from\_domestic\_league) %>%

head(10) %>%

knitr::kable(format = "html",

caption = "Breakdown of Player Contribution by League") %>%

kableExtra::kable\_styling(full\_width = FALSE)

| Breakdown of Player Contribution by League | | | | |
| --- | --- | --- | --- | --- |
| **Country** | **League (country name)** | **Number of players from league** | **Percentage of players from league** | **Percentage of players from domestic league** |
| Qatar | Qatar – league | 23 | 100.0% | 100.0% |
| Bolivia | Bolivia – league | 20 | 87.0% | 87.0% |
| Japan | Japan – league | 14 | 60.9% | 60.9% |
| Ecuador | Ecuador – league | 9 | 39.1% | 39.1% |
| Paraguay | Paraguay – league | 8 | 34.8% | 34.8% |
| Brazil | England – league | 7 | 30.4% | 13.0% |
| Uruguay | Spain – league | 6 | 26.1% | 4.3% |
| Peru | Peru – league | 6 | 26.1% | 26.1% |
| Chile | Chile – league | 6 | 26.1% | 26.1% |
| Argentina | Argentina – league | 5 | 21.7% | 21.7% |

Three interesting facts I found:

* 30% of players on the Brazil squad play for an English team, most  
  out of any league – squad combination excluding domestic leagues.
* 100% of the Qatar squad play in their domestic league!
* Only one Uruguayan player (4.3%) plays in its domestic league.

**Player contribution by club**

In the final plot for this section, I looked at the top 10 clubs  
contributing the most players to the tournament. I used  
arrange(desc(n)) %>% slice() instead of top\_n() as sometimes top\_n() grabs  
way too many teams that are tied with the same value. To set the team names inside the bars I  
created a midpoint value midval that calculated a value half of the  
number of players contributed so the labels were placed neatly.

player\_contrib\_club\_plot <- squads\_df\_clean %>%

group\_by(club) %>%

summarize(n = n()) %>%

mutate(club = club %>% forcats::as\_factor() %>% forcats::fct\_reorder(n),

midval = n / 2) %>%

arrange(desc(n)) %>%

slice(1:15) %>%

ggplot(aes(x = club, y = n)) +

geom\_col(fill = "red") +

geom\_text(aes(label = n, family = "Roboto Condensed", fontface = "bold"),

size = 7.5, color = "yellow",

nudge\_y = 0.5) +

geom\_text(aes(y = midval, label = club,

family = "Roboto Condensed", fontface = "bold"),

size = 5, color = "white") +

coord\_flip() +

scale\_y\_continuous(breaks = scales::pretty\_breaks(),

expand = c(0, 0),

limits = c(0, 10.5)) +

labs(title = "Top 15 Clubs contributing the most players to the Copa América",

x = "Club", y = "Number of players",

caption = "Source: Wikipedia") +

theme\_copaAmerica(

title.size = 18,

subtitle.size = 12,

caption.size = 8,

axis.text.size = 14,

axis.title.size = 16,

strip.text.size = 18,

panel.grid.major.y = element\_blank(),

panel.grid.minor.x = element\_line(color = "white")) +

theme(axis.text.y = element\_blank(),

axis.ticks.y = element\_blank())

player\_contrib\_club\_plot

With 100% of its players coming from the domestic league it’s not  
surprise that the Qatari team, Al-Sadd, is contributing the most players  
to the tournament. Tied with another Qatari team, Mexican club America  
features 7 players yet none of them are Mexicans (2 Argentineans, 2  
Colombians, 1 Ecuadorian, 1 Chilean, and 1 Paraguayan).

At first I thought Barcelona contributed 8 players until I realized the  
Ecuadorian players were coming from the Ecuadorian team called  
Barcelona…I had to go all the way back up to the beginning of this  
section to fix that small peculiarity. As futbol came to South America  
via European colonists and immigrants a lot of teams took up the names  
and colors of the teams these Europeans were fond of. Other examples  
include Liverpool F.C. (Montevideo, Uruguay), Arsenal de Sarandi (Buenos  
Aires, Argentina), and Club Atletico Juventus (Sao Paulo, Brazil –  
although they use the colors of Torino F.C.).

If you download the data and type in the code below you can see the  
entire club-country list.

squads\_df\_clean %>%

group\_by(club, country) %>%

summarize(n = n()) %>% View()

**Match Records**

Now that we got a good look at the composition of the teams, we can take  
a look at how they’ve done at every Copa América.

The next code chunk mainly comes from PH Julien and his excellent Kaggle  
kernel of [“A Journey Through The History of  
Soccer”](https://www.kaggle.com/phjulien/a-journey-through-the-history-of-soccer/).

## grab football federation affiliations data

federation\_files <- Sys.glob("../data/federation\_affiliations/\*")

df\_federations = data.frame(country = NULL, federation = NULL)

for (f in federation\_files) {

federation = basename(f)

content = read.csv(f, header=FALSE)

content <- cbind(content,federation=rep(federation, dim(content)[1]))

df\_federations <- rbind(df\_federations, content)

}

colnames(df\_federations) <- c("country", "federation")

df\_federations <- df\_federations %>%

mutate(country = as.character(country) %>% str\_trim(side = "both"))

results\_raw <- readr::read\_csv("../data/results.csv")

results\_copa <- results\_raw %>%

filter(tournament == "Copa América") %>%

rename(venue\_country = country,

venue\_city = city) %>%

mutate(match\_num = row\_number())

## combine with federation affiliations

results\_copa\_home <- results\_copa %>%

left\_join(df\_federations,

by = c("home\_team" = "country")) %>%

mutate(federation = as.character(federation)) %>%

rename(home\_federation = federation)

results\_copa\_away <- results\_copa %>%

left\_join(df\_federations,

by = c("away\_team" = "country")) %>%

mutate(federation = as.character(federation)) %>%

rename(away\_federation = federation)

## combine home-away

results\_copa\_cleaned <- results\_copa\_home %>%

full\_join(results\_copa\_away)

Unfortunately, this data does not have **penalty** results as those  
games are all counted as a draw (as technically that is the actual  
result). Considering there a lot of cagey knock-out rounds that finish  
in a penalty shoot-out (including the last two finals…) it is  
unfortunate but that’s just the data you have sometimes. There is a way  
to web-scrape all the Copa América results and assign Win-Lose to those  
games that went to penalties but I’ll leave that for another time. Also,  
there is no info on what stage of the tournament the match recorded is  
in.

results\_copa\_cleaned <- results\_copa\_cleaned %>%

mutate(

home\_federation = case\_when(

home\_team == "USA" ~ "Concacaf",

TRUE ~ home\_federation),

away\_federation = case\_when(

away\_team == "USA" ~ "Concacaf",

TRUE ~ away\_federation)) %>%

select(-contains("federation"), -contains("venue"),

-neutral, date, home\_team, home\_score, away\_team, away\_score,

tournament, venue\_city)

glimpse(results\_copa\_cleaned)

## Observations: 787

## Variables: 8

## $ date 1916-07-02, 1916-07-06, 1916-07-08, 1916-07-10, 19...

## $ home\_team "Chile", "Argentina", "Brazil", "Argentina", "Brazi...

## $ away\_team "Uruguay", "Chile", "Chile", "Brazil", "Uruguay", "...

## $ home\_score 0, 6, 1, 1, 1, 0, 4, 4, 1, 4, 5, 1, 6, 2, 0, 3, 4, ...

## $ away\_score 4, 1, 1, 1, 2, 0, 0, 2, 0, 0, 0, 0, 0, 3, 2, 1, 1, ...

## $ tournament "Copa América", "Copa América", "Copa América", "Co...

## $ match\_num 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, ...

## $ venue\_city "Buenos Aires", "Buenos Aires", "Buenos Aires", "Bu...

Now that it’s nice and cleaned up I created a function that reshapes the  
data so that it’s set from a certain team’s perspective with the “team”  
argument. You can also set the function to look for only results against  
a certain opponent by filling in the versus argument.

copaAmerica\_resultados <- function(data, team, versus = NA) {

## team of interest: ex. 'Brazil'

team\_var <- enquo(team)

todos\_partidos <- data %>%

## filter only for results of team of interest

filter(home\_team == !!team\_var | away\_team == !!team\_var) %>%

## reshape columns to team vs. opponent

mutate(

opponent = case\_when(

away\_team != !!team\_var ~ away\_team,

home\_team != !!team\_var ~ home\_team),

home\_away = case\_when(

home\_team == !!team\_var ~ "home",

away\_team == !!team\_var ~ "away"),

equipo\_goals = case\_when(

home\_team == !!team\_var ~ home\_score,

away\_team == !!team\_var ~ away\_score),

opp\_goals = case\_when(

home\_team != !!team\_var ~ home\_score,

away\_team != !!team\_var ~ away\_score)) %>%

## label results from team's perspective

mutate(

result = case\_when(

equipo\_goals > opp\_goals ~ "Win",

equipo\_goals < opp\_goals ~ "Loss",

equipo\_goals == opp\_goals ~ "Draw")) %>%

mutate(result = result %>% forcats::as\_factor() %>% forcats::fct\_relevel(c("Win", "Draw", "Loss"))) %>%

select(-contains("score"), -contains("team"), -match\_num) %>%

rename(Date = date, Tournament = tournament, `Venue` = venue\_city, Opponent = opponent, `Home / Away` = home\_away,

`Goals For` = equipo\_goals, `Goals Against` = opp\_goals, Result = result)

if (is.na(versus) | is.null(versus)) {

resultados\_totalmente <- todos\_partidos %>%

group\_by(Result, Opponent) %>%

mutate(n = n()) %>%

ungroup() %>%

## sum amount of goals by team and opponent

group\_by(Result, Opponent) %>%

summarize(e\_g = sum(`Goals For`),

o\_g = sum(`Goals Against`),

n = n()) %>%

ungroup() %>%

## spread results over multiple columns

spread(Result, n) %>%

mutate\_if(is.integer, as.numeric)

missing\_cols <- c("Win", "Draw", "Loss") %>%

map\_dfr( ~tibble(!!.x := numeric()))

resultados\_totalmente <- resultados\_totalmente %>%

bind\_rows(missing\_cols) %>%

mutate(Win = if\_else(is.na(Win), 0, Win),

Draw = if\_else(is.na(Draw), 0, Draw),

Loss = if\_else(is.na(Loss), 0, Loss)) %>%

group\_by(Opponent) %>%

summarize(Win = sum(Win, na.rm = TRUE),

Draw = sum(Draw, na.rm = TRUE),

Loss = sum(Loss, na.rm = TRUE),

`Goals For` = sum(e\_g),

`Goals Against` = sum(o\_g))

return(list(resultados\_totalmente, todos\_partidos))

} else {

## opponent: ex. 'Argentina'

todos\_partidos <- todos\_partidos %>%

filter(Opponent == versus)

if (nrow(todos\_partidos) == 0) {

return(glue("{team} has never played {versus} at the Copa América!"))

} else {

resultados\_totalmente <- todos\_partidos %>%

group\_by(Result, Opponent) %>%

mutate(n = n()) %>%

ungroup() %>%

# sum amount of goals by team and opponent

group\_by(Result, Opponent) %>%

summarize(e\_g = sum(`Goals For`),

o\_g = sum(`Goals Against`),

n = n()) %>%

ungroup() %>%

# spread results over multiple columns

spread(Result, n) %>%

mutate\_if(is.integer, as.numeric) %>%

group\_by(Opponent) %>%

summarize(Win = sum(Win, na.rm = TRUE),

Draw = sum(Draw, na.rm = TRUE),

Loss = sum(Loss, na.rm = TRUE),

`Goals For` = sum(e\_g),

`Goals Against` = sum(o\_g))

return(list(resultados\_totalmente, todos\_partidos))

}

}

}

The output is either a dataframe of all the games a team has been  
involved in as well as the record of the team against other teams in the  
Copa América or a message saying that the team you picked has never  
played against the opponent you picked.

**Japan**

copaAmerica\_resultados(data = results\_copa\_cleaned,

team = "Japan", versus = "Brazil")

## Japan has never played Brazil at the Copa América!

Oh… that’s right Japan has never played against Brazil at the Copa…

resultados\_japon <- copaAmerica\_resultados(data = results\_copa\_cleaned, team = "Japan")

resultados\_japon[[2]] %>%

knitr::kable(format = "html",

caption = "Japan's record in the Copa América") %>%

kableExtra::kable\_styling(full\_width = FALSE)

| Japan’s record in the Copa América | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Tournament** | **Venue** | **Opponent** | **Home / Away** | **Goals For** | **Goals Against** | **Result** |
| 1999-06-29 | Copa América | Asunción | Peru | away | 2 | 3 | Loss |
| 1999-07-02 | Copa América | Asunción | Paraguay | away | 0 | 4 | Loss |
| 1999-07-05 | Copa América | Pedro Juan Caballero | Bolivia | away | 1 | 1 | Draw |

Japan’s only previous journey to the Copa América was in the 1999  
edition where they lost all 2 games and drew against Bolivia. They were also invited for the 2011  
edition but withdrew due to the Tohoku Earthquake and were replaced by  
Costa Rica. Japanese football has come a long way since 1999 but with a  
young squad this tournament it will be a uphill battle to get 3 points against any of  
their Group C opponents, Uruguay, Chile, and Ecuador.

**Colombia**

resultados\_colombia <- copaAmerica\_resultados(data = results\_copa\_cleaned, team = "Colombia")

resultados\_colombia[[2]] %>%

slice(87:92) %>%

knitr::kable(format = "html",

caption = "Colombia's record in the Copa América") %>%

kableExtra::kable\_styling(full\_width = FALSE)

| Colombia’s record in the Copa América | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Tournament** | **Venue** | **Opponent** | **Home / Away** | **Goals For** | **Goals Against** | **Result** |
| 2001-07-11 | Copa América | Barranquilla | Venezuela | home | 2 | 0 | Win |
| 2001-07-14 | Copa América | Barranquilla | Ecuador | home | 1 | 0 | Win |
| 2001-07-17 | Copa América | Barranquilla | Chile | home | 2 | 0 | Win |
| 2001-07-23 | Copa América | Armenia | Peru | home | 3 | 0 | Win |
| 2001-07-26 | Copa América | Manizales | Honduras | home | 2 | 0 | Win |
| 2001-07-29 | Copa América | Bogotá | Mexico | home | 1 | 0 | Win |

Despite a recent resurgence of the Colombia national team they have not  
been able to match the feats of the 2001 side that won the Copa with  
their best place finish since then coming 3rd in 2004. The 2001 team  
were not only unbeaten but also did not concede a single goal throughout  
the tournament!

**Superclásico Sudamericano: Brazil vs. Argentina**

resultados\_de\_brazil <- copaAmerica\_resultados(data = results\_copa\_cleaned,

team = "Brazil", versus = "Argentina")

resultados\_de\_brazil[[1]] %>%

knitr::kable(format = "html",

caption = "Brazil vs. Argentina in the Copa América") %>%

kableExtra::kable\_styling(full\_width = FALSE)

| Brazil vs. Argentina in the Copa América | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Opponent** | **Win** | **Draw** | **Loss** | **Goals For** | **Goals Against** |
| Argentina | 9 | 8 | 15 | 38 | 52 |

resultados\_de\_brazil[[2]] %>%

tail(5) %>%

knitr::kable(format = "html",

caption = "Brazil vs. Argentina in the Copa América") %>%

kableExtra::kable\_styling(full\_width = FALSE)

| Brazil vs. Argentina in the Copa América | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Tournament** | **Venue** | **Opponent** | **Home / Away** | **Goals For** | **Goals Against** | **Result** |
| 1993-06-27 | Copa América | Guayaquil | Argentina | home | 1 | 1 | Draw |
| 1995-07-17 | Copa América | Rivera | Argentina | home | 2 | 2 | Draw |
| 1999-07-11 | Copa América | Ciudad del Este | Argentina | home | 2 | 1 | Win |
| 2004-07-25 | Copa América | Lima | Argentina | away | 2 | 2 | Draw |
| 2007-07-15 | Copa América | Maracaibo | Argentina | home | 3 | 0 | Win |

Brazil does not have a good overall record vs. Argentina but they have  
not lost against their rivals at the Copa América since the 1993 edition  
where they lost 5-6 on penalties in the Quarter Finals. The “draw” in  
1995 was won on penalties while the “draw” in 2004 was actually in the  
final where they won 4-2 on penalties.

What I found odd was that the Copa América seems to have a very low  
priority to certain countries, especially Brazil who have repeatedly  
sent their B or C teams to the tournament in favor of sending their best  
team to other tournaments or resting star players. Funnily enough these  
understrength Brazilian squads have actually won the entire tournament a  
few times, most notably in 2007 against a full strength Argentina side  
containing the likes of Zanetti, Riquelme, Cambiasso, Tevez, a young  
Messi/Mascherano, Cambiasso, et al!

**Player Profiles**

After looking at the history of the competition and the composition of  
the squads I examined the players and their form coming into the Copa  
América. In recent years football analytics has really taken off and  
there have been many strides made in creating more informative  
statistics to assess players’ abilities, the most prominently being the  
**xG** statistics. This is the first time I talk about **xG** in any  
length/depth so this introduction is as much to solidify my  
understanding as well as yours!

**What IS xG?**

* **xG**: Quantitative measure (between 0 and 1) that assigns a  
  probability that a shot taken will result in a goal based on a  
  variety of variables and is used for evaluating the quality of  
  chances and predicting players’ and teams’ future performances.
* **xA**: Quantitative measure (between 0 and 1) that assigns a  
  probability that a given pass will result in an assist for a goal  
  based on a variety of variables.

Common variables used in the models that output xG statistics are the  
distance and angle of a shot, the body part used, rebound, among others.  
Similar to how you might assess your favorite striker’s chances of  
scoring just as he is lining up to take a shot: Is the shot a header? Is  
he trying to score from a cross in regular play or a corner kick? Are  
there a crowd of defenders in front of him or is he one-on-one with the  
goalkeeper? Etc. You might think **who** is taking the shot would be a genuine  
factor but in actuality it tells you a lot less about the chances of a  
goal compared to the location of the shot.

Note that there isn’t a SINGLE xG model. You can check out a blog post  
comparing different people’s xG models  
[here](https://mackayanalytics.nl/2017/06/19/how-accurate-are-xg-models-ii-the-big-chance-dilemma/).  
People and organizations (from Statsbomb to OptaPro) have their own  
ideas about what **could** be the important variables in play and as  
such it’s important to report from which source you got your data from  
as the stats can differ between models. A few things xG does not factor  
in are things like goalkeeper performance (someone pulling off  
incredible saves or letting in a poor shot) and one must also consider  
the fact that team style of play and the quality of a player’s  
teammates. When judging players based on these stats it is important to  
be aware of contextual factors like the team they play for, their  
opponent, and the player’s position/role in the team.

From xG and xA more granular statistics such as xGChain and xGBuildup  
were created to be able to dig a little deeper into who is contributing  
to chance creation, I’ll introduce the latter two a bit later. As the  
field has grown new statistics have popped up such as [Karun  
Singh](https://twitter.com/karun1710/)’s “expected threat” or xT. You  
can check out an introduction to xT from  
[here](https://karun.in/blog/expected-threat.html).

Of course, these statistics only tell a part of the story and are  
definitenly not the be-all-and-end-all. In the context of this current  
blog post, these stats only tell the story about how these players did  
for their club teams this past season rather than for their national  
team. Even still it gives us a good idea of what kind of form these  
players are in coming into this tournament.

You might also want to watch these Youtube videos by  
[TifoFootball](https://www.youtube.com/channel/UCGYYNGmyhZ_kwBF_lqqXdAQ)  
for a quick primer on [xG](https://www.youtube.com/watch?v=zSaeaFcm1SY)  
and [xA](https://www.youtube.com/watch?v=1MdlkuzLdj4).

**understat data**

For the data I used the website, understat.com. Their xG models were  
created via training a neural network on a dataset consisting of over  
100,000 shots using more than 10 different variables. Getting data from  
understat has been made easy by Ewen Henderson’s understatr package  
available from [Github](https://github.com/ewenme/understatr) (he’s also  
the guy that made the [ghibli](https://github.com/ewenme/ghibli) color  
palette!). I tried to pick a wide selection of attacking players but I  
was also limited by the fact that understat only has data for  
teams/players from six European leagues (Premier League, Bundesliga,  
Serie A, La Liga, Ligue 1, and Russian Premier League).

For **Peru** I would have chosen Paolo Guerrero but as he plays in  
Brazil now I went with Jefferson Farfan (who hasn’t played as many games  
as the other players used for comparison unfortunately…). For **Chile**  
I would pick Eduardo Vargas but he as doesn’t play for a team covered by  
understat I went with Alexis Sanchez, who had a woeful season and only  
played ~600 minutes despite appearing in ~20 league matches and later  
added Arturo Vidal. For **Brazil** I included Neymar initially but since  
he won’t actually be playing I’ll keep him for comparison’s sake but  
also include Gabriel Jesus and Roberto Firmino who have been fighting  
for the starting striker spot. Note that these two aren’t the ones  
replacing Neymar **positionally**. In Neymar’s left-wing position I can  
see David Neres or Phil Coutinho replacing him (Richarlison and Willian  
mostly play on the right). (Edit: In the first match vs. Bolivia, David  
Neres started off on the left while Richarlison played on the right,  
Coutinho played just behind Bobby Firmino)

The other nation’s strikers/attacking midfielders don’t play for the six  
European leagues covered by understat or like in Shinji Okazaki’s case  
just did not play as many minutes/games during the season. To get the  
data I created a list of the player codes and use purrr::map() to  
iterate each through the understatr::get\_player\_seasons\_stats()  
function.

player\_codes <- c(2097, 2099, 813, ## Messi, Neymar, Rondon

498, 4299, 696, ## Alexis, Farfan, Falcao

3294, 2098, 5543, ## Cavani, Suarez, G. Jesus

482, 1148, 2249, ## Bobby, Duvan, James

1089, 3553, 488, ## Cuadrado, Di Maria, Coutinho

222) ## Arturo Vidal

understat\_data <- player\_codes %>%

map(., ~ understatr::get\_player\_seasons\_stats(.x)) %>%

reduce(bind\_rows) %>%

select(-player\_id, -position, -yellow, -red)

glimpse(understat\_data)

## Observations: 83

## Variables: 15

## $ games 34, 36, 34, 33, 38, 17, 20, 30, 34, 33, 32, 36, 38...

## $ goals 36, 34, 37, 26, 43, 15, 19, 13, 24, 22, 11, 7, 8, ...

## $ shots 170, 196, 179, 158, 187, 55, 91, 105, 124, 95, 89,...

## $ time 2704, 2995, 2832, 2726, 3374, 1443, 1797, 2652, 30...

## $ xG 25.997169, 28.946281, 26.885174, 27.101910, 35.891...

## $ assists 13, 12, 9, 16, 18, 7, 13, 11, 12, 7, 7, 3, 2, 2, 0...

## $ xA 15.33516552, 15.10040562, 13.95513140, 15.87127814...

## $ key\_passes 93, 87, 79, 77, 95, 43, 70, 91, 102, 52, 32, 23, 2...

## $ year 2018, 2017, 2016, 2015, 2014, 2018, 2017, 2016, 20...

## $ team\_name "Barcelona", "Barcelona", "Barcelona", "Barcelona"...

## $ npg 32, 32, 31, 23, 38, 10, 15, 12, 19, 21, 11, 7, 8, ...

## $ npxG 22.280909, 25.973170, 21.682231, 21.899351, 31.432...

## $ xGChain 38.459877, 48.180634, 42.525045, 41.996866, 54.753...

## $ xGBuildup 10.6987990, 21.6344040, 18.1335122, 15.1963644, 19...

## $ player\_name "Lionel Messi", "Lionel Messi", "Lionel Messi", "L...

As you can see the data consists of a row for each player and each year  
(from the 2014/2015 season to the 2018/2019 season). I tried to mitigate  
the fact that some players played a lot more minutes than others by  
standardize everything to a ‘per 90 minutes’ value but this does have  
its own disadvantages. These include the fact that players who play a  
lot of minutes (as regular starting members) may not have as high ‘per  
90’ stat even though their production with all these minutes might  
suggest that they are consistently performing and producing at a high  
level.

It’ll be a bit crowded (kind of like a spilt box of Skittles…) but let’s  
check out the key metrics for all the players at once.

Note: npg = non-penalty goals, npxG = non-penalty goals xG

comparison\_data <- understat\_data %>%

filter(year == 2018) %>%

select(-games, -team\_name, -year) %>%

rename(Shots = shots, KP = key\_passes) %>%

gather(key = "key", value = "value", -player\_name, -time) %>%

mutate(key = forcats::as\_factor(key) %>%

forcats::fct\_relevel(.,

"xG", "goals", "npxG", "npg",

"xA", "assists", "xGChain", "xGBuildup",

"Shots", "KP"))

comparison\_strikers\_plot <- comparison\_data %>%

filter(key != "Shots", key != "KP",

key != "xGBuildup", key != "xGChain") %>%

mutate(value = value / time \* 90) %>%

ggplot(aes(x = key, y = value, fill = player\_name)) +

geom\_jitter(shape = 21, size = 5, color = "black", width = 0.25, stroke = 1.1) +

geom\_vline(xintercept = 1.5, size = 2) +

geom\_vline(xintercept = 2.5, size = 2) +

geom\_vline(xintercept = 3.5, size = 2) +

geom\_vline(xintercept = 4.5, size = 2) +

geom\_vline(xintercept = 5.5, size = 2) +

coord\_flip() +

scale\_y\_continuous(expand = c(0.01, 0.01),

limits = c(0, 1.26)) +

scale\_fill\_manual(values = pals::glasbey(16), name = "Player") +

labs(title = "Comparison: Top attackers at the Copa América",

subtitle = "For select group of attacking players with data available from understat.com",

x = NULL, y = "Metric per 90",

caption = glue::glue("

data: understat.com

2018-2019 Season")) +

theme\_copaAmerica(title.size = 18,

subtitle = 12,

panel.grid.minor.x = element\_line(color = "white"))

comparison\_strikers\_plot

As usual in these types of charts, Messi is leading a lot of the metrics  
here and showing consistency too with having played the third highest  
amount of minutes out of the selected players. It’s helpful to have the  
xG/xA stats next to the actual goals/assists as it provides an  
indication of whether the player in question is scoring shots that he  
probabilistically should be scoring. When a player’s actual goal count  
is higher than their xG stat this suggests that the player is  
**“exceeding their xG”** or that they are scoring from shots that are  
historically hard to score from. It can be seen as a marker of an elite  
finisher as they are putting away chances from difficult situations  
consistently. In terms of assists and xA Alexis Sanchez, who only played  
about 600 minutes, looks a lot better than in reality due to the  
aforementioned disadvantage of standardizing everything to a “per 90  
minutes” value. Normally you would have a cut-off based on a certain  
**minimum amount of minutes** but as I mentioned I was rather limited in  
my choice of players.

A way to take a closer look at xG – Goals and xA – Assists is to use a  
simple dot plot with a line going through the 45 degree angle. Those  
below the line are underperforming relative to their xG or xA stat,  
those over it are overachieving (“exceeding” their xG/xA stat) while  
those just on the line are scoring or assisting right around what the  
model expects the player to be. I use non-penalty xG below as penalties  
have around ~0.75 xG (give or take a few percentage points depending on  
the model) and can inflate the stats of those players who take a lot of  
penalties and score them, especially if they weren’t the ones who earned  
the penalty themselves.

expected\_goal\_plot <- understat\_data %>%

filter(year == 2018) %>%

select(player\_name, time, npxG, xG, goals) %>%

mutate\_at(c("npxG", "xG", "goals"), ~. / time \* 90) %>%

ggplot(aes(x = npxG, y = goals, fill = player\_name)) +

geom\_abline(intercept = 0, slope = 1, color = "white", size = 1.1) +

geom\_point(shape = 21, size = 5, color = "black", stroke = 1.1) +

scale\_x\_continuous(limits = c(0, 1.1),

expand = c(0, 0)) +

scale\_y\_continuous(limits = c(0, 1.3),

expand = c(0, 0)) +

scale\_fill\_manual(values = pals::glasbey(16), name = "Player") +

labs(title = "Expected vs. Actual Goals",

subtitle = "For select group of attacking players with data available from understat.com",

x = "Non-penalty xG per 90 minutes",

y = "Goals per 90 minutes",

caption = glue::glue("

data: understat.com

2018-2019 Season")) +

theme\_copaAmerica(panel.grid.minor.x = element\_line(color = "white"),

panel.grid.minor.y = element\_line(color = "white"),

subtitle.size = 11)

expected\_goal\_plot

Gabriel Jesus is quite clearly below the 45 degree line meaning that he  
has been very poor at finishing chances (and/or incredibly unlucky).  
After a poor World Cup where he scored 0 goals as a starter, he is  
really going to have to step up to fill Neymar’s goalscoring boots for  
this tournament. However, his build-up play for City has still been good  
this past season and he has been scoring for Brazil in the friendlies  
leading up to the tournament so it’s going to be a hard decision for  
Tite to decide on who starts against Bolivia (edit: Firmino started and  
contributed an assist while Jesus replaced him in the 65th minute).

expected\_assists\_plot <- understat\_data %>%

filter(year == 2018) %>%

select(player\_name, time, xA, assists) %>%

mutate\_at(c("xA", "assists"), ~. / time \* 90) %>%

ggplot(aes(x = xA, y = assists, fill = player\_name)) +

geom\_abline(intercept = 0, slope = 1, color = "white", size = 1.1) +

geom\_point(shape = 21, size = 5, color = "black", stroke = 1.1) +

labs(title = "Expected vs. Actual Assists",

subtitle = "For select group of attacking players with data available from understat.com",

x = "xA per 90 minutes",

y = "Assists per 90 minutes",

caption = glue::glue("

data: understat.com

2018-2019 Season")) +

scale\_x\_continuous(limits = c(0, 0.55),

expand = c(0, 0)) +

scale\_y\_continuous(limits = c(0, 0.55),

expand = c(0, 0)) +

scale\_fill\_manual(values = pals::glasbey(16), name = "Player") +

theme\_copaAmerica(panel.grid.minor.x = element\_line(color = "white"),

panel.grid.minor.y = element\_line(color = "white"),

subtitle.size = 11)

expected\_assists\_plot

One thing to keep in mind is that xA does not take into account the  
recipient of the assist pass. Even if the pass given had a high expected  
assist value the receiving player still might not have the quality to  
put it away through no fault of the passer. This might explain why most  
of the players with a higher xA among this group don’t have the assists  
to match. It can also be that these players are also the ones playing a  
lot more minutes and the volume of chances they create just aren’t  
translating to goals all the time.

**Key Passes, Shots, xGChain, and xGBuildup (per 90)**

I separated “key passes” and “shots” as well as “xGChain” and  
“xGBuildup” from the rest as these two sets were on a very different  
scale.

kp\_shots\_plot <- comparison\_data %>%

filter(key == "Shots" | key == "KP") %>%

mutate(value = value / time \* 90) %>%

ggplot(aes(x = key, y = value, fill = player\_name)) +

geom\_jitter(shape = 21, size = 5, color = "black", width = 0.25, stroke = 1.1) +

coord\_flip() +

scale\_y\_continuous(expand = c(0.01, 0.01),

limits = c(0, 6),

breaks = c(0, 1, 2, 3, 4, 5, 6),

labels = c(0, 1, 2, 3, 4, 5, 6)) +

scale\_fill\_manual(values = pals::glasbey(17), name = "Player") +

geom\_vline(xintercept = 1.5, size = 2) +

labs(title = "Comparison: Stars of the Copa América",

subtitle = glue("

KP = Key Passes

For select group of attacking players with data available from understat.com"),

x = NULL, y = "Metric per 90",

caption = glue::glue("

data: understat.com

2018-2019 Season")) +

theme\_copaAmerica(title.size = 18,

subtitle.size = 10,

panel.grid.minor.x = element\_line(color = "white"))

kp\_shots\_plot

* xGChain: Quantitative measure that is the combined sum of the xG of  
  every possession that ends in a shot that a player is involved in.  
  The same derived value is given to each of the players involved and  
  allows us to credit players for attacking contributions outside of  
  just shots (xG) and assists (xA).
* xGBuildup: Similar to xGChain but excluding shots and assists. This  
  is in response to xGChain values still being dominated by the xG and  
  xA from shots and assists, respectively.

xgbuildup\_xgchain\_plot <- comparison\_data %>%

filter(key == "xGBuildup" | key == "xGChain") %>%

mutate(value = value / time \* 90) %>%

ggplot(aes(x = key, y = value, fill = player\_name)) +

geom\_jitter(shape = 21, size = 5, color = "black", width = 0.25, stroke = 1.1) +

coord\_flip() +

scale\_y\_continuous(expand = c(0.01, 0.01),

limits = c(0, 1.55),

breaks = c(0, 0.25, 0.5, 0.75, 1, 1.25, 1.5),

labels = c(0, 0.25, 0.5, 0.75, 1, 1.25, 1.5)) +

scale\_fill\_manual(values = pals::glasbey(17), name = "Player") +

geom\_vline(xintercept = 1.5, size = 2) +

labs(title = "Comparison: Stars of the Copa América",

subtitle = "For select group of attacking players with data available from understat.com",

x = NULL, y = "Metric per 90",

caption = glue::glue("

data: understat.com

2018-2019 Season")) +

theme\_copaAmerica(title.size = 18,

subtitle.size = 10,

panel.grid.minor.x = element\_line(color = "white"))

xgbuildup\_xgchain\_plot

Although Gabriel Jesus has been poor at finishing his chances as seen in  
previous graphs, his xGChain and xGBuildup stat makes it clear that he  
is still contributing to City’s attack outside of scoring goals himself  
(not to mention all the defensive work he does as well).

For example below, the stats are able to clearly differentiate between  
James, who is more of a playmaker, compared to Falcao and Duvan who are  
traditional number 9s with his superior xGBuildup, xGChain, and Key  
Passes values. For a more detailed overview on xGChain and xGBuildup  
check out Statsbomb’s article  
[here](https://statsbomb.com/2018/08/introducing-xgchain-and-xgbuildup/).

## keep colors for Colombians consistent with other plots

colombia\_pal <- c("#000033", "#005300", "#009FFF", "#00FFBE")

comparison\_colombia\_plot <- comparison\_data %>%

filter(!key %in% c("xG", "goals", "npxG", "npg", "xA", "assists"),

player\_name %in% c("James Rodríguez", "Falcao", "Duván Zapata", "Juan Cuadrado")) %>%

mutate(value = value / time \* 90) %>%

ggplot(aes(x = key, y = value, fill = player\_name)) +

geom\_point(shape = 21, size = 5, color = "black", stroke = 1.1) +

geom\_vline(xintercept = 1.5, size = 2) +

geom\_vline(xintercept = 2.5, size = 2) +

geom\_vline(xintercept = 3.5, size = 2) +

coord\_flip() +

scale\_y\_continuous(expand = c(0.05, 0.05),

breaks = c(0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4),

labels = c(0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4)) +

scale\_fill\_manual(values = colombia\_pal, name = "Player") +

labs(title = "Comparison: Stars of Colombia",

subtitle = "KP: Key Passes",

x = NULL, y = "Metric per 90",

caption = glue::glue("

data: understat.com

2018-2019 Season")) +

theme\_copaAmerica(title.size = 20,

subtitle.size = 12,

panel.grid.minor.x = element\_line(color = "white"))

comparison\_colombia\_plot

There are lots of different ways to visualize this data, most famously  
the radar charts created by [Statsbomb](http://statsbomb.com/). Using  
the data you can also compare and evaluate players in many different  
ways and using understatr package you could add a few more players  
like Paulo Dybala, Miguel Almiron, and more! I could probably do a whole  
other article using just this data but I’ll leave it here for now.

**Conclusion**

Throughout this blog post I talked about some of the historical records,  
squad compositions, match records, and finally the player profiles of  
attacking players at this summer’s Copa América. Using the power of R it  
is really easy to webscrape and visualize data in a way that is  
informative and aesthetically pleasing. I wanted to finish this before  
the tournament started but other life things got in the way as well as  
the fact that the amount of content ballooned out of control (especially  
the xG section) so I had to cut down a lot.

It’s been fun reading the articles on the Copa América website and  
seeing how far my “intermediate-but-very-out-of-practice”-level of  
Spanish can get me to understand the content, here is one that I  
particularly liked reading: [14 Estadisticas de la Copa  
América](https://copaamerica.com/es/noticias/a-14-dias-del-inicio-de-la-copa-14-estadisticas-de-la-copa-america).  
With so many tournaments going on right now (and with the African Cup of  
Nations starting in a few days) a lot of the news media is spread thin  
right now but there are still some quality articles out there to read  
about the Copa, like [this  
article](https://www.bbc.com/sport/football/48600098) from BBC’s South  
American football expert, Tim Vickery.

After the first round of games, a few points of discussion:

* After an extremely lacklustre performance vs. Colombia, how does  
  Argentina bounce back? What tactical changes need to be made?
* Qatar impressed against Paraguay but can they pull off a major upset  
  vs. Colombia?
* How will Japan line-up against Uruguay after a losing by a scoreline  
  that didn’t really do their performance justice? How will manager  
  Moriyasu balance experience vs. youth, will he start with veteran  
  Okazaki after Ueda’s numerous misses vs. Chile? How will Japan deal with their  
  glaring weaknesses at the fullback position? Will Yuta Nakayama keep his place after  
  an awful performance?
* Can Brazil earn a early ticket to the next round vs. Venezuela after  
  a clinical but not excellent performance vs. Bolivia? Will they be  
  able to keep up their streak of winning the Copa every time they  
  have hosted it?