

16 NOVIEMBRE, 2019

Análisis de datos en el fútbol

library(soccergraphR) library(FootballBadges)

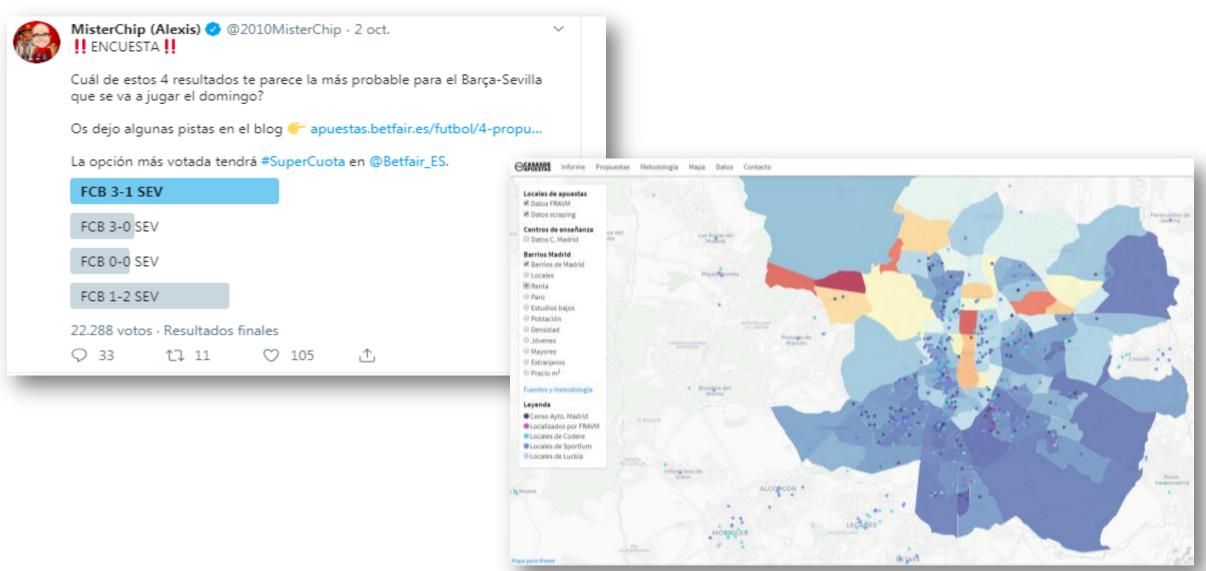
Jesús Lagos Milla



https://github.com/Jelagmil/



¿De qué no vamos a hablar? De apuestas.



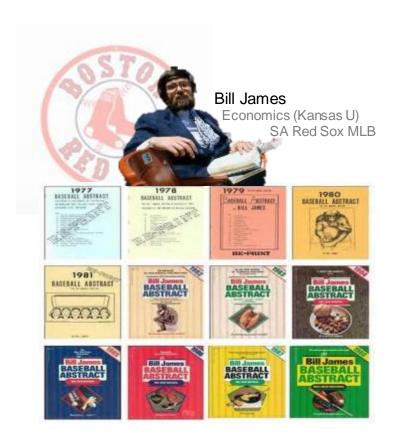
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- 2 Los datos
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- 4 Proveedores de información
- 5 xG
- 6 Dashboard Rmarkdown SNA
- 7 #soccergraphR y #FootballBadges



Introducción

·----- 70's-80's ----- 10's ------



Runs Created -> Expected Runs



Billy Beane Economics* (UC San Diego) VP Op OA's MLB

Paul DePodesta Economics (Harvard U) CSO Cleveland Browns NFL



Record* 20 victorias seguidas (actualemente 22) Coste plantilla 28 de 30 (40M) -> A. Rodriguez (Rangers) (22M)



Susana Ferreras
Telecomunication (U. Valladoilid)
Data Scientist Arsenal EPL

Esta zamorana experta en 'big data' es el gran secreto de la selección española de 'basket'



```
1 #' Esta funcion crea el grafo de pases para un equipo durante un partido a partir de una
               segmentacion kmeans de posiciones. Es decir, si un pase lo hace en la misma zona 2 jugadores
               computan como 1, porque lo que se dibuja es el cluster en esa zona de pase independiente quien
                lo haya hecho
               @param df Un df
                @param home Un número de 1 y 0 que indica si es home o away
                @param cl El número de clusters que queremos calcular en la red
        #'@return El grafo de \code{df} del equipo local si \code{home} con un total de \code{cl} clusters
               @examples
               OptaMAPmatrixpasscluster(df,1,20)
         #' OptaMAPmatrixpasscluster(df,1,10)
               @export
14
15
16
17 - OptaMAPmatrixpasscluster <- function(df,home,cl){
18
         polar<-dplyr::select(df,type_id,team_id,outcome,x,y,player_id,"2","107","123","213","home_team_id","away_team_id","140","141")
         #Cambiamos los nombres que los numeros no gustan
         names(polar)<-c("type_id","team_id","outcome","x","y","player_id","a","b","c","d","e","f","g","h")</pre>
22
23
24
25 v if(home==1){
              polar <- dplyr::filter(polar,team_id==e)}</pre>
27 ♥ else{
28
             polar <- dplyr::filter(polar,team_id!=e)</pre>
29
30
         #Nos quedamos los eventos de pase
         polar <- dplyr::filter(polar,type_id==1 & is.na(a) & is.na(b) & is.na(c))</pre>
33
         polar \(\frac{1}{2}\)yd<-polar \(\frac{1}{2}\)
34
         polar $hd<-polar $h*0.7
36
         df1<-dplyr::select(polar,x,yd)
        df2<-dplyr::select(polar,g,hd)
        names(df2) < -c('x', 'yd')
        matriz <- rbind(df1,df2)
41
        set.seed(76964057) #Set the seed for reproducibility
43
       k <-kmean
                                                                                                                                               columns 1 and 2
44 k$centers
45 table(k$c
                                                                                                                                                ter
46
        matriz_c
47
                                                2. Los datos
         polar_clu
                                                                                                                                                 ,all.x=TRUE)
49
       names(po
50
51 matriz_ce
52 matriz_ce
                                                                                                                                                     "VALUE")
```

El problema a resolver

captura manual



```
k?xml version="1.0" encoding="UTF-8"?>
 <!-- Copyright 2001-2017 Opta Sportsdata Ltd. All rights reserved. -->
produced on:
                        valde-jobg-a03.nexus.opta.net
     production time: 20170829T142750.440Z
     production module: Opta::Feed::XML::Soccer::F24
Games timestamp="2017-08-29T15:27:49">
  <Game id="942802" away score="2" away team id="175" away team name="Atlético de Madrid" competition id="23" c</pre>
    <Event id="1172050263" event_id="1" type_id="34" period_id="16" min="0" sec="0" team_id="175" outcome="1" x</pre>
      <Q id="1668338652" qualifier id="30" value="81352, 17804, 174888, 17871, 151883, 65807, 119718, 89335, 76
      <Q id="1223863195" qualifier id="59" value="13, 20, 19, 14, 24, 15, 10, 8, 7, 9, 6, 1, 11, 12, 16, 17, 22
      <Q id="1111726103" qualifier_id="197" value="3919" />
      <Q id="2109104967" qualifier id="130" value="2" />
      <Q id="1347204679" qualifier_id="194" value="17871" />
      <Q id="1913281233" qualifier_id="131" value="1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 0, 0, 0, 0, 0, 0, 0" />
      <Q id="2003123833" qualifier_id="44" value="1, 2, 2, 3, 2, 2, 3, 3, 4, 4, 3, 5, 5, 5, 5, 5, 5, 5, 5 />
    <Event id="1658372008" event id="1" type id="34" period id="16" min="0" sec="0" team id="2893" outcome="1"</pre>
      <Q id="1531987612" qualifier id="194" value="139472" />
      <Q id="1763026283" qualifier_id="197" value="704" />
      <Q id="1425278767" qualifier_id="59" value="1, 25, 11, 20, 2, 5, 8, 6, 7, 9, 24, 18, 12, 13, 15, 17, 21,
      <Q id="1539294426" qualifier id="130" value="17" />
      <Q id="1781136519" qualifier_id="30" value="14725, 170154, 87713, 61595, 55317, 67759, 131411, 139472, 49
      <Q id="1257025587" qualifier id="131" value="1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 0, 0, 0, 0, 0, 0, 0 />
      <Q id="1239938889" qualifier_id="44" value="1, 3, 3, 2, 2, 2, 3, 3, 4, 4, 4, 5, 5, 5, 5, 5, 5, 5, 5 />
    <Event id="1603877925" event id="2" type id="32" period id="1" min="0" sec="0" team id="175" outcome="1" x=
      <Q id="1540932256" qualifier_id="127" value="Left to Right" />
    <Event id="1345146864" event_id="2" type_id="32" period_id="1" min="0" sec="0" team_id="2893" outcome="1" x</pre>
      <Q id="1155187686" qualifier_id="127" value="Right to Left" />
    <Event id="1326165929" event_id="3" type_id="1" period_id="1" min="0" sec="1" player_id="49464" team_id="28</pre>
      <Q id="1414422520" qualifier_id="212" value="6.2" />
      <Q id="1658041010" qualifier_id="140" value="44.1" />
      <Q id="2095436383" qualifier id="279" value="S" />
      <Q id="1179282307" qualifier id="213" value="2.9" />
      <Q id="1129907827" qualifier id="141" value="53.7" />
      <Q id="1841260011" qualifier id="278" />
      <Q id="1257966679" qualifier id="56" value="Back" />
```

Se puede explotar con la librería para R #soccergraphR



```
"id": "d23c1959-8805-42aa-933b-b6710b6a50e5",
"index" : 1,
"period" : 1,
"timestamp" : "00:00:00.000",
"minute" : 0,
"second" : 0,
"type" : {
 "id" : 35,
 "name" : "Starting XI"
"possession" : 1,
"possession_team" : (
 "id" : 865,
  "name" : "England Women's"
"play_pattern" : (
 "id" : 1,
  "name" : "Regular Play"
"off_camera" : false
"team" : {
 "id" : 865,
 "name" : "England Women's"
"duration" : 0.0,
"tactics" : {
 "formation" : 4141,
 "lineup" : [ (
    "player" : {
      "id" : 10170,
      "name" : "Karen Bardsley"
    1.
    "position" : {
```

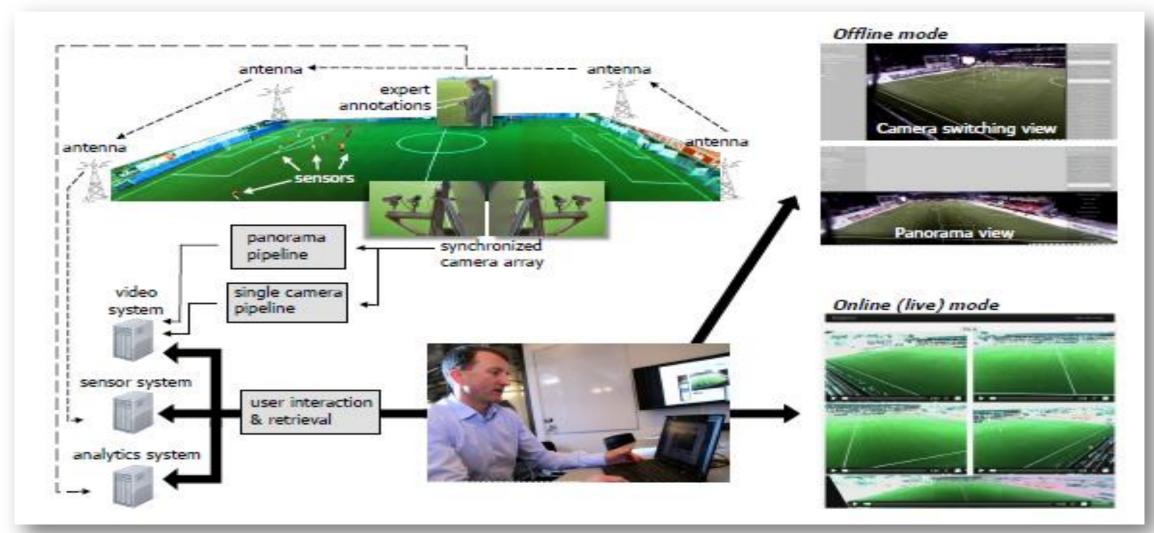
Se puede explotar con la librería para R #StatbombR

devtools::install_github('jelagmil/soccergraphR', build_opts = c("--no-resave-data", "--no-manual"), = TRUE)

El problema a resolver

captura manual

video



El problema a resolver

captura manual

video

weareables



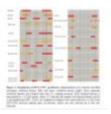




- Rendimiento físico y predicción de lesiones
- Scouting
- Métricas de juego
- Táctica y estrategia
- Acciones a Balón Parado
- Tracking



BARÇA SPORTS ANALYTICS SUMMIT



Explainable Injury Forecasting in Soccer via Multivariate Time Series and Convolutional Neural Networks

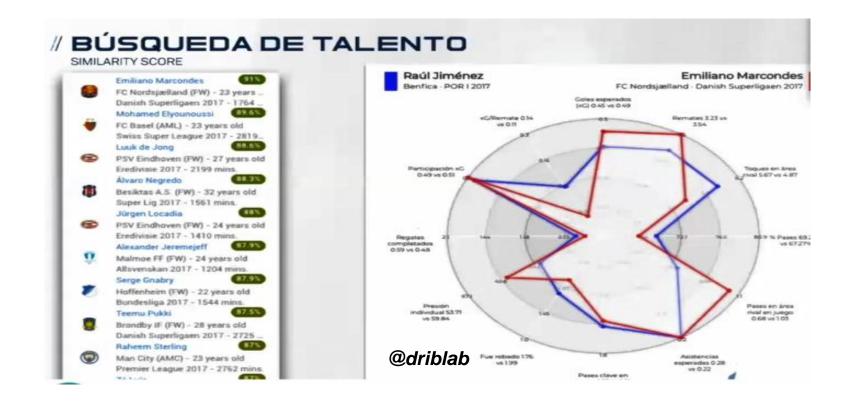
Luca Pappalardo¹, Luca Guerrini², Alessio Rossi², Paolo Cintia²



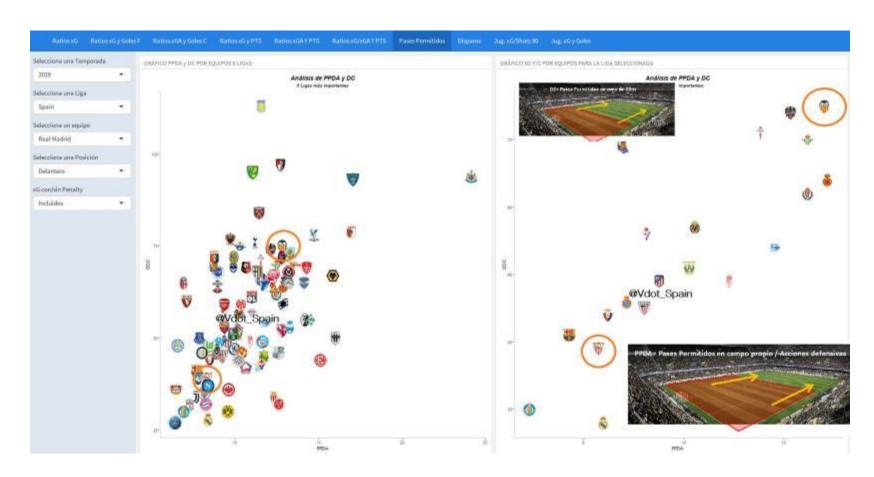
Institute of Information Science and Technologies (ISTI), National Research Council of Italy (CNR), Pisa, Italy

² Department of Computer Science, University of Pisa, Pisa, Italy

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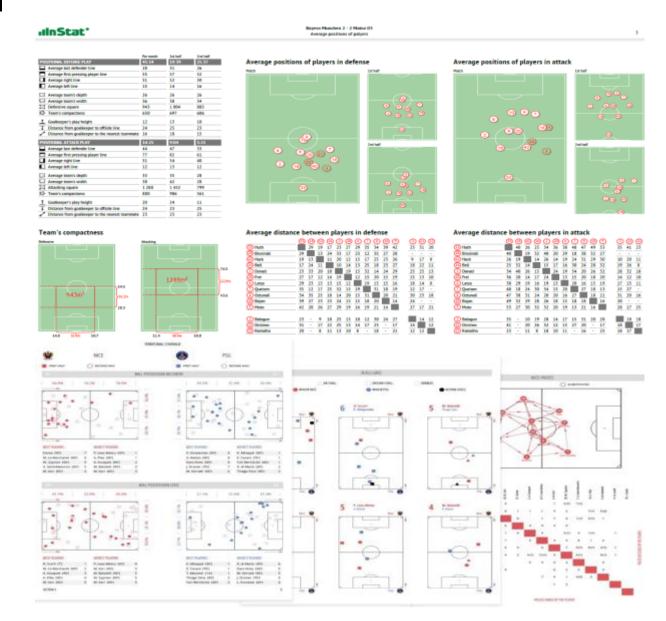


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xG, npxG, xA, xT, xBuildup, xGChain, PPDA, DC, xPTS, etc.

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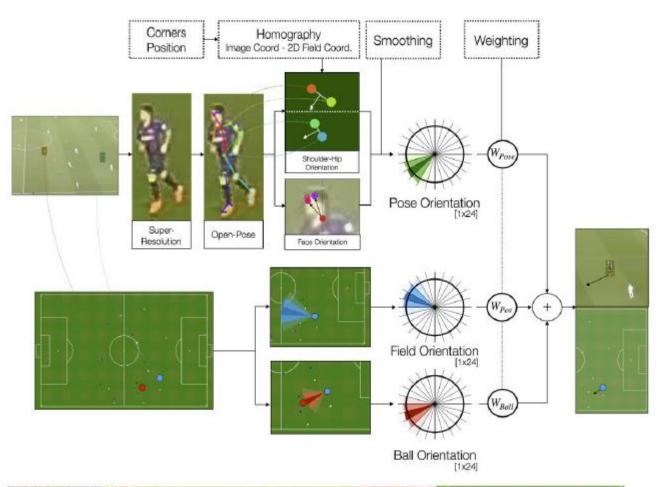


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Head, Shoulders, Hip and Ball... Hip and Ball! Using Pose Data to Leverage Football Player Orientation

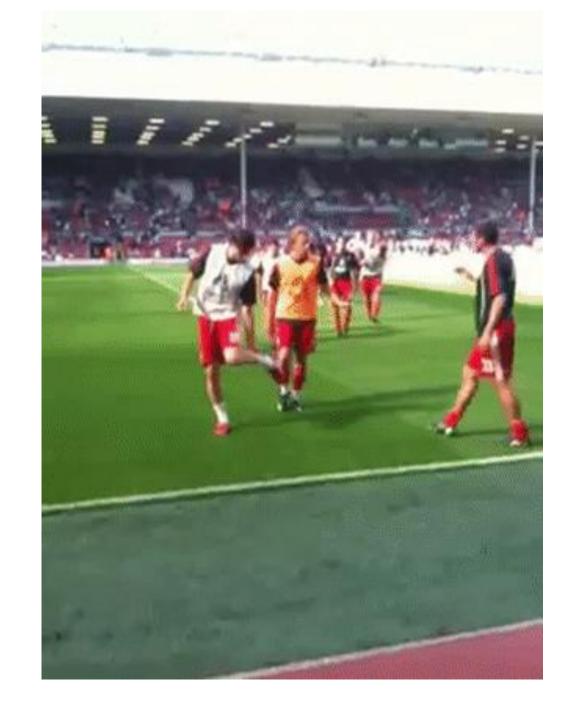
Adrià Arbués-Sangüesa, Gloria Haro, Coloma Ballester, Adrián Martín

Universitat Pompeu Fabra | adria.arbues@upf.edu

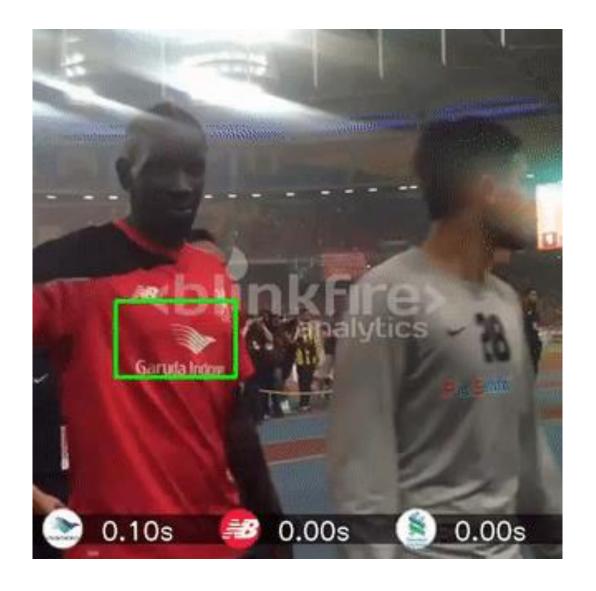




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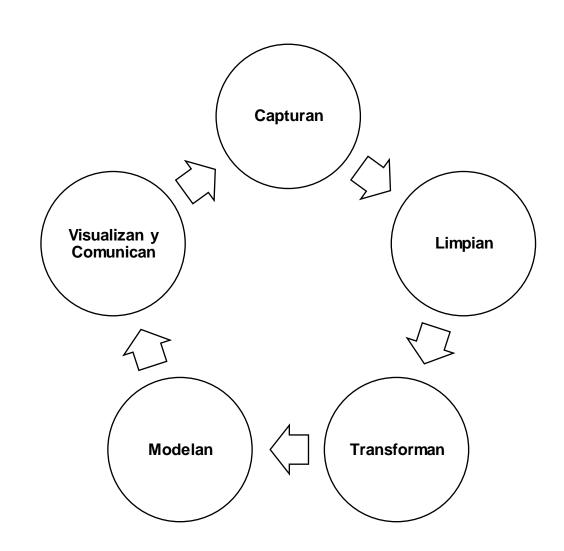


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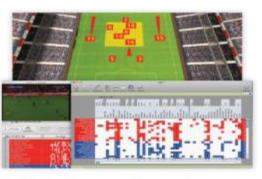




- o opta
- instat
- wyscout
- o mediacoach
- o stats
- statsbomb
- understat



- opta
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XML Data Feeds

Opta have made market leading XML feeds compatible with other market leading products such as Scout7-Xeatre and SportsCode to ensure clubs get the maximum value out of these systems. Clubs can now have a consistent data set across all of their analysis products.



Live Monitor

Live Monitor provides an online tool through which to monitor your teams performance live as a game progresses. View the impact of tactical changes via a pass matrix, player stats and graphics of average shape or player possessions. Compatible with any tablet platform Live Monitor offers the flexibility to access stats anywhere during your own



Video Scout

Opta have developed a unique online interface that allows clubs to download match footage online and search the actions within it using Opta's time coded events. Users can create unlimited playlists from clips across multiple matches and download them as a single movie.



Reports & Analysis

Our skilled team of data analysts can provide clubs with reports and analysis packs based on pre-agreed criteria. This can be weekly opponent scouting reports or own-team performance over weeks, months or seasons. This can be provided in a wide variety of formats for ease of circulation within the club itself



Data Scout

Developed in conjunction with StratBridge LLC, Data Scout is the next generation of football player analysis software. This entirely online solution allows users to explore Opta's massive player database, run comparisons and view trends over time.



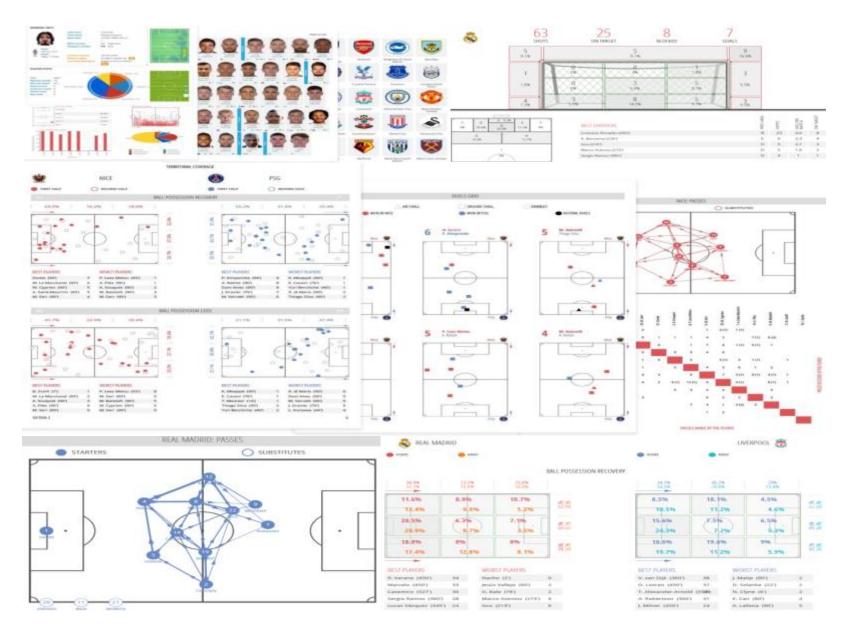
Data Query Tool

Accessed entirely online, the Opta Data Query Tool allows users to select any competition, followed by specific teams, players and positions to create a multivariate table. This can be customised across over 120 different variables across multiple or single seasons.

- o opta
- instat
- wyscout
- o **mediacoach**
- o stats
- statsbomb
- understat



- o opta
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- understat



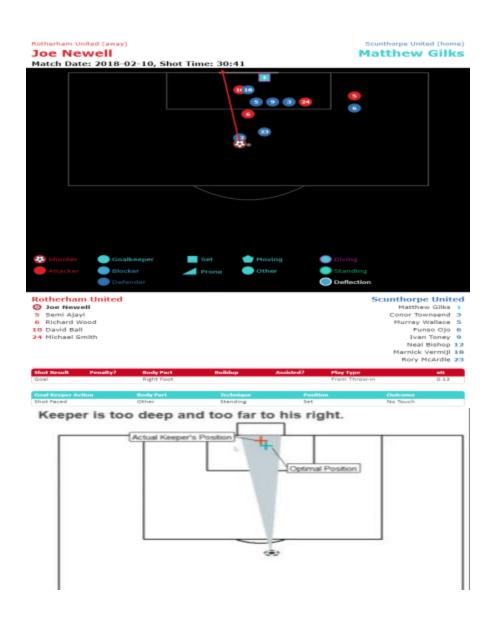
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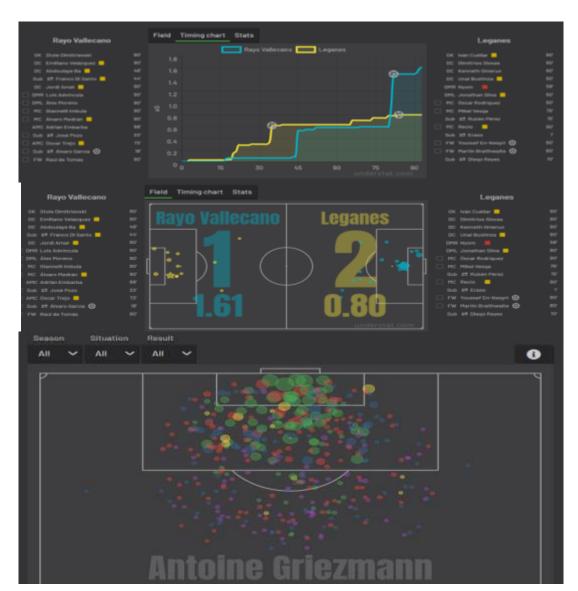
- o opta
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- wyscout
- o mediacoach
- o stats
- statsbomb
- o **understat**



- o opta
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- o **understat**



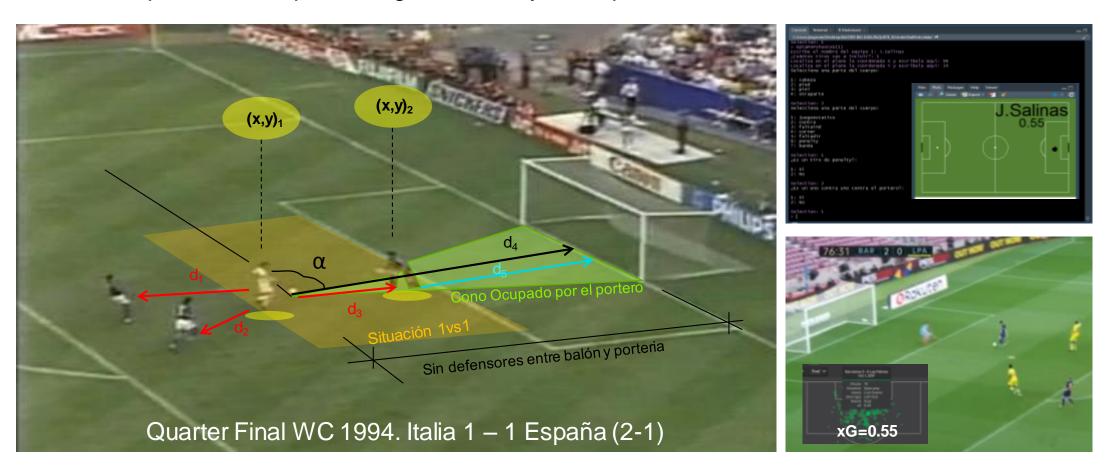
- o opta
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```
1 #' Esta funcion crea el grafo de pases para un equipo durante un partido a partir de una
               segmentacion kmeans de posiciones. Es decir, si un pase lo hace en la misma zona 2 jugadores
               computan como 1, porque lo que se dibuja es el cluster en esa zona de pase independiente quien
                lo haya hecho
               @param df Un df
               @param home Un número de 1 y 0 que indica si es home o away
                @param cl El número de clusters que queremos calcular en la red
               @return El grafo de \code{df} del equipo local si \code{home} con un total de \code{cl} clusters
               @examples
               OptaMAPmatrixpasscluster(df,1,20)
         #' OptaMAPmatrixpasscluster(df,1,10)
               @export
14
15
16
17 - OptaMAPmatrixpasscluster <- function(df,home,cl){
18
         polar<-dplyr::select(df,type_id,team_id,outcome,x,y,player_id,"2","107","123","213","home_team_id","away_team_id","140","141")
         #Cambiamos los nombres que los numeros no gustan
         names(polar)<-c("type_id","team_id","outcome","x","y","player_id","a","b","c","d","e","f","g","h")</pre>
22
23
24
25 v if(home==1){
              polar <- dplyr::filter(polar,team_id==e)}</pre>
27 ♥ else{
28
             polar <- dplyr::filter(polar,team_id!=e)</pre>
29
30
         #Nos quedamos los eventos de pase
         polar <- dplyr::filter(polar,type_id==1 & is.na(a) & is.na(b) & is.na(c))</pre>
33
         polar \(\frac{1}{2}\)yd<-polar \(\frac{1}{2}\)
34
         polar $hd<-polar $h*0.7
36
        df1<-dplyr::select(polar,x,yd)
         df2<-dplyr::select(polar,g,hd)
        names(df2) < -c('x', 'yd')
        matriz <- rbind(df1,df2)
41
        set.seed(76964057) #Set the seed for reproducibility
43
        k <-kmean
                                                                                                                                               columns 1 and 2
44 k$centers
45
      table(k$0
                                                                                                                                                ter
46
         matriz_c
47
                                           5. Ejemplo xG
48
        polar_clu
                                                                                                                                                  .all.x=TRUE)
49
       names(po
50
51 matriz_ce
52 matriz_ce
                                                                                                                                                     "VALUE")
```

Expected Goals

Expected goals (xG) es una métrica que asigna a cada disparo la probabilidad de que sea gol a partir de variables como distancia, ángulo o situación. El \sum xG de un jugador o equipo nos ayudan a conocer la eficacia cara a puerta al comparar los goles reales y los esperados.



Los feeds



```
k?xml version="1.0" encoding="UTF-8"?>
 <!-- Copyright 2001-2017 Opta Sportsdata Ltd. All rights reserved. -->
valde-jobg-a03.nexus.opta.net
     produced on:
     production time: 20170829T142750.440Z
     production module: Opta::Feed::XML::Soccer::F24
Games timestamp="2017-08-29T15:27:49">
  <Game id="942802" away score="2" away team id="175" away team name="Atlético de Madrid" competition id="23" c</pre>
    <Event id="1172050263" event_id="1" type_id="34" period_id="16" min="0" sec="0" team id="175" outcome="1" x</pre>
      <Q id="1668338652" qualifier id="30" value="81352, 17804, 174888, 17871, 151883, 65807, 119718, 89335, 76
      <Q id="1223863195" qualifier id="59" value="13, 20, 19, 14, 24, 15, 10, 8, 7, 9, 6, 1, 11, 12, 16, 17, 22
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      <Q id="1347204679" qualifier_id="194" value="17871" />
      <Q id="1913281233" qualifier_id="131" value="1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 0, 0, 0, 0, 0, 0, 0" />
      <Q id="2003123833" qualifier_id="44" value="1, 2, 2, 3, 2, 2, 3, 3, 4, 4, 3, 5, 5, 5, 5, 5, 5, 5, 5" />
    <Event id="1658372008" event id="1" type id="34" period id="16" min="0" sec="0" team id="2893" outcome="1"</pre>
      <Q id="1531987612" qualifier id="194" value="139472" />
      <Q id="1763026283" qualifier_id="197" value="704" />
      <Q id="1425278767" qualifier_id="59" value="1, 25, 11, 20, 2, 5, 8, 6, 7, 9, 24, 18, 12, 13, 15, 17, 21,
      <Q id="1539294426" qualifier id="130" value="17" />
      <Q id="1781136519" qualifier_id="30" value="14725, 170154, 87713, 61595, 55317, 67759, 131411, 139472, 49
      <Q id="1257025587" qualifier id="131" value="1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 0, 0, 0, 0, 0, 0, 0 />
      <Q id="1239938889" qualifier_id="44" value="1, 3, 3, 2, 2, 2, 3, 3, 4, 4, 4, 5, 5, 5, 5, 5, 5, 5, 5 />
    <Event id="1603877925" event id="2" type id="32" period id="1" min="0" sec="0" team id="175" outcome="1" x=
      <Q id="1540932256" qualifier_id="127" value="Left to Right" />
    <Event id="1345146864" event_id="2" type_id="32" period_id="1" min="0" sec="0" team_id="2893" outcome="1" x</pre>
      <Q id="1155187686" qualifier_id="127" value="Right to Left" />
    <Event id="1326165929" event_id="3" type_id="1" period_id="1" min="0" sec="1" player_id="49464" team_id="28</pre>
      <Q id="1414422520" qualifier_id="212" value="6.2" />
      <Q id="1658041010" qualifier_id="140" value="44.1" />
      <Q id="2095436383" qualifier id="279" value="S" />
      <Q id="1129907827" qualifier id="141" value="53.7" />
      <Q id="1841260011" qualifier id="278" />
      <Q id="1257966679" qualifier id="56" value="Back" />
```

Se puede explotar con la librería para R #soccergraphR



```
"id" | "d23c1959-8805-42aa-933b-b6710b6a50e5",
"index" : 1,
"period" : 1,
"timestamp" : "00:00:00.000",
"minute" : 0,
"second" : 0,
"type" : {
 "id" : 35,
 "name" : "Starting XI"
"possession" : 1,
"possession_team" : (
 "id" : 865,
  "name" : "England Women's"
"play_pattern" : (
 "id" : 1,
  "name" : "Regular Play"
"off camera" : false,
"team" : {
 "id" : 865,
 "name" : "England Women's"
"duration" : 0.0,
"tactics" : {
 "formation": 4141,
 "lineup" : [ (
    "player" : {
      "id" : 10170,
      "name" : "Karen Bardsley"
    1.
    "position" : {
```

Se puede explotar con la librería para R #StatbombR

devtools::install_github('jelagmil/soccergraphR', build_opts = c("--no-resave-data", "--no-manual"), = TRUE)

Ejemplo cálculo xG

Datos de partida:

- F24_17/18 opta
- F24_18/19
- 1.339.254 eventos

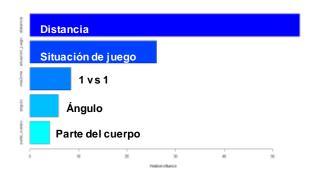
Disparos:

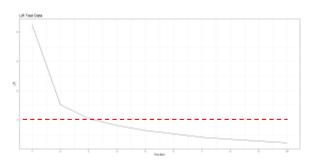
- Type_id=13,14,15,16
- **18.976 disparos**
- **Goles 2056**
- **No goles 16901**
 - Distancia (num)
 - Ángulo (num)
 - 1vs1(factor 2)
 - Situación de juego (factor 8)
 - o Parte cuerpo (factor 4)

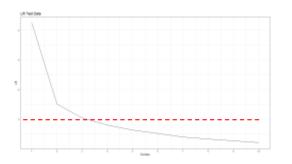
library(gbm)

- Train/test (50%)
- cv.folds=5
- In.depth 1
- Minobsinnode 10
- Shrinkage 0.01

AUC Train=0.807 AUC Test=0.804



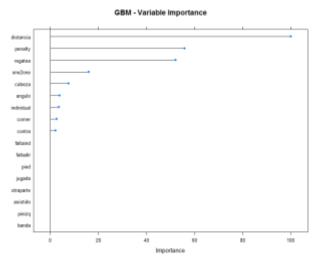


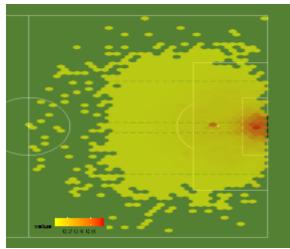


Library(caret)

- Train/test (50%)
- cv.folds=5
- In.depth 1
- Minobsinnode 5
- Shrinkage 0.1

AUC Train=0.807 AUC Test=0.819

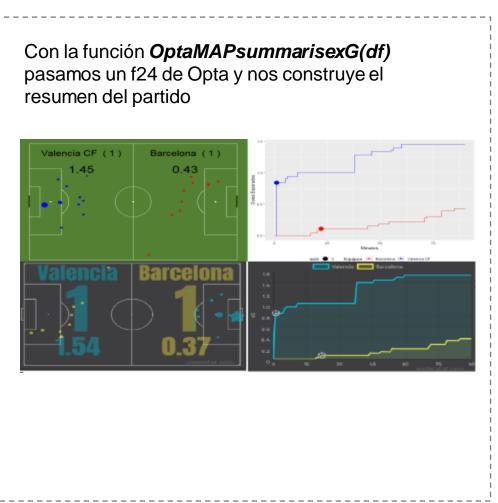




Expected Goals con #soccergraphR

En el paquete #soccergraph se incluye la función *OptaMAPshootxG()* que incluye un model xG propio basado en datos de opta como el modelo anterior y que permite pintar los mapas de xG que podemos ver en redes sociales a partir de un data entry en consola:



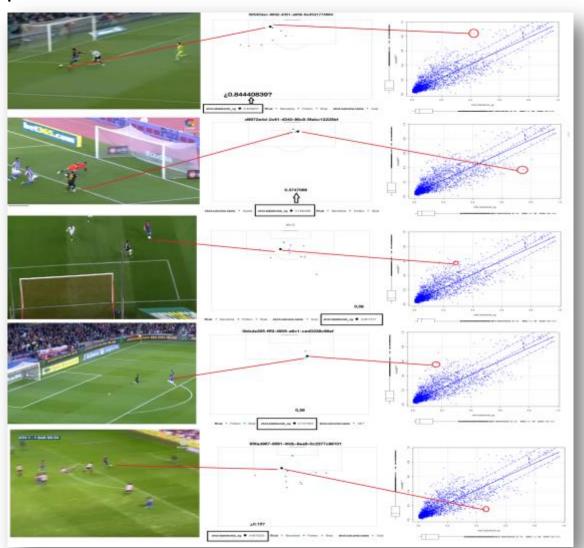


Expected Goals con #soccergraphR

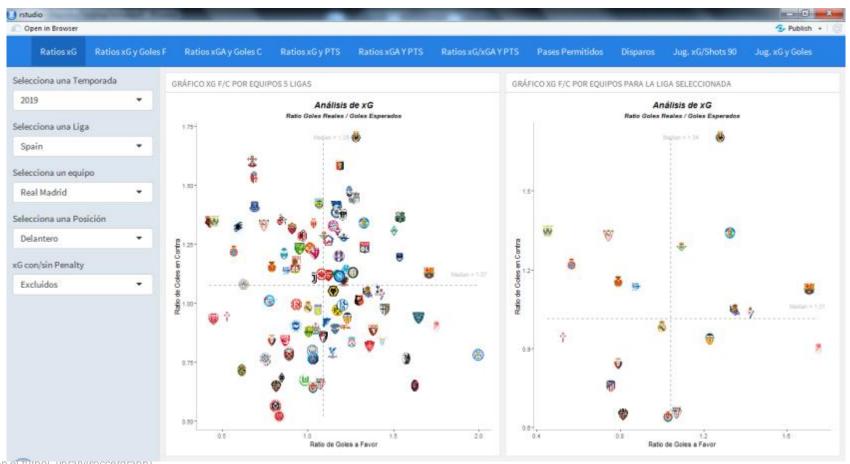
Statsbomb en su feed incluye el "frezze frame" que nos permite calcular las métricas anteriores.



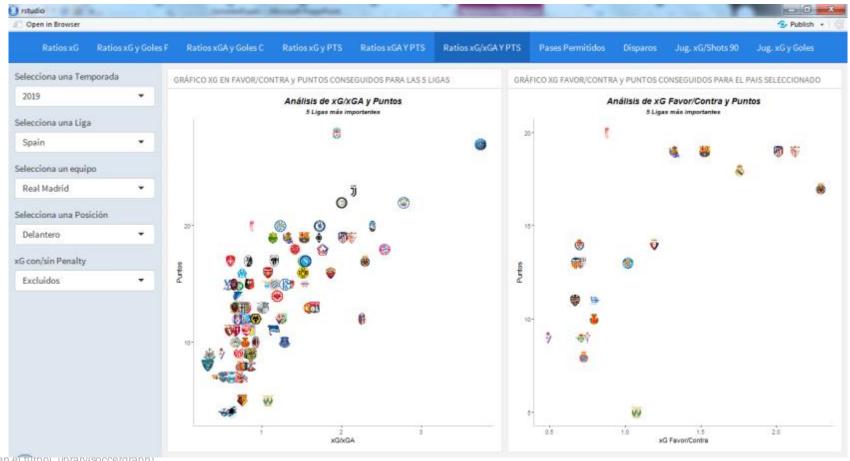




- Rendimiento de un equipo en ataque y defensa
- Rendimiento de un jugador
- ¿quién se mereció ganar? ¿fue un resultado justo?



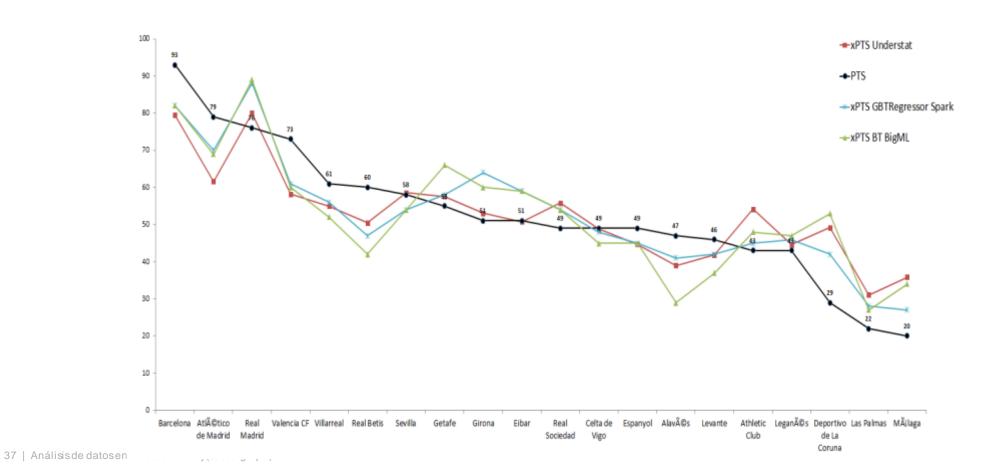
- Rendimiento de un equipo en ataque y defensa
- Rendimiento de un jugador
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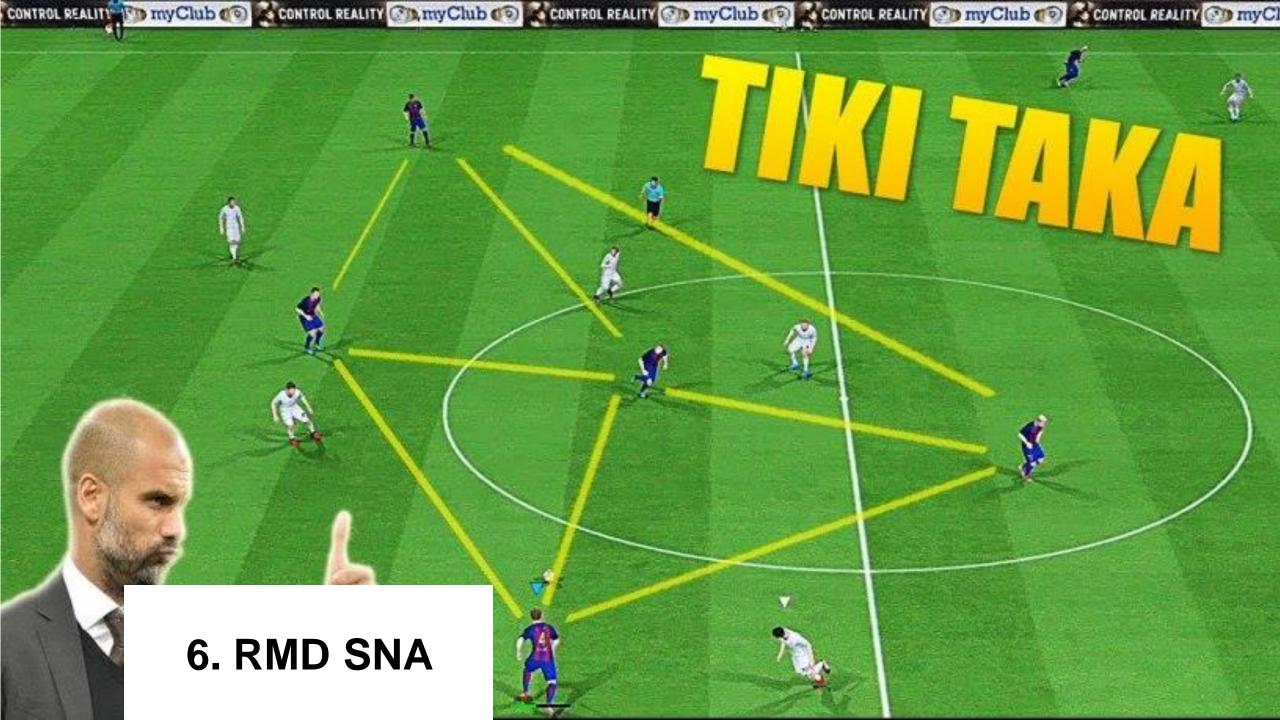


- Rendimiento de un equipo en ataque y defensa
- Rendimiento de un jugador
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- Rendimiento de un equipo en ataque y defensa
- Rendimiento de un jugador
- ¿quién se mereció ganar? ¿fue un resultado justo?





- Métricas y grafos, pase avanzado y kmeans
- Densidades
- Centralidad
- Fútbol Masculino vs Femenino

Betweenness

The betweenness centrality of a node v is given by the expression:

$$g(v) = \sum_{s \neq v \neq t} \frac{\sigma_{st}(v)}{\sigma_{st}}$$

where σ_{st} is the total number of shortest paths from node s to node t and $\sigma_{st}(v)$ is the number of those paths that pass through v.

Density [edit]

The density D of a network is defined as a ratio of the number of edges E to the number of possible edges in a network with N nodes, given (in the case of simple graphs) by the binomial coefficient $\binom{N}{2}$, giving $D = \frac{E - (N - 1)}{Emax - (N - 1)} = \frac{2(E - N + 1)}{N(N - 3) + 2}$ Another possible equation is $D = \frac{T - 2N + 2}{N(N - 3) + 2}$, whereas the ties T are unidirectional

(Wasserman & Faust 1994) [2] This gives a better overview over the network density because unidirectional relationships can be measured

Average shortest path length (or characteristic path length) [edit]

The average shortest path length is calculated by finding the shortest path between all pairs of nodes, and taking the average over all paths of the length thereof (the length being the number of intermediate edges contained in the path, i.e., the distance $d_{u,v}$ between the two vertices u,v within the graph). This shows us, on average, the number of steps it takes to get from one member of the network to another. The behavior of the expected average shortest path length (that is, the ensemble average of the average shortest path length) as a function of the number of vertices N of a random network model defines whether that model exhibits the small-world effect; if it scales as $O(\ln N)$, the model generates small-world nets. For faster-than-logarithmic growth, the model does not produce small worlds. The special case of $O(\ln \ln N)$ is known as ultra-small world effect.

Using network science to analyze football passing networks: dynamics, space, time and the multilayer nature of the game

J.M. Buldú, J. Busquets, J.H. Martínez, J.L. Herrera-Diestra, I. Echegoyen, J. Galeano, J. Luque

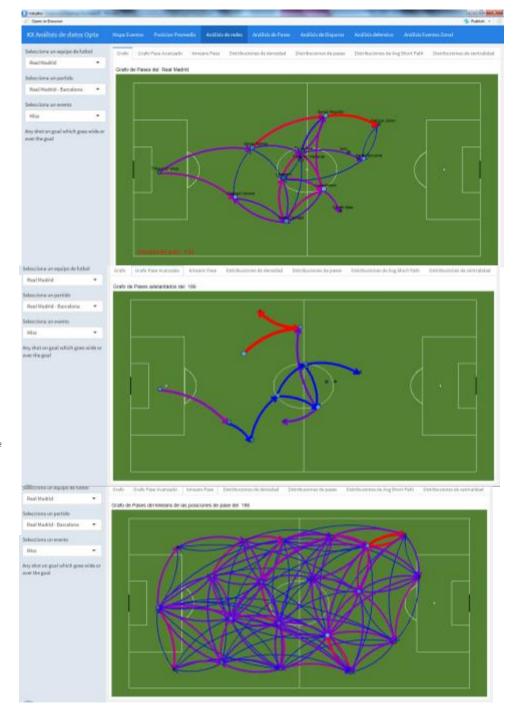
(Submitted on 2 Jul 2018 (v1), last revised 4 Jul 2018 (this version, v3))

From the diversity of applications of Network Science, in this Opinion Paper we are concerned about its potential to analyze one of the most extended group sports. Football (soccer in U.S. terminology). As we will see, Network Science allows addressing different aspects of the team organization and performance not captured by classical analyses based on the performance of individual players. The reason behind reties on the complex nature of the game, which, paraphrasing the foundational paradigm of complexity sciences "can not be analyzed by looking at its components (i.e., players) individually but, on the contrary, considering the system as a whole" or, in the classical words of after-match interviews "it's not just me, it's the team".

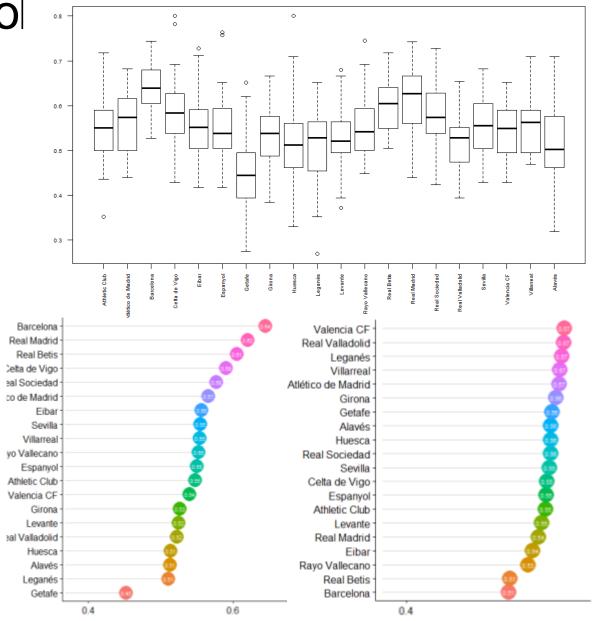
Comments: 7 pages, 1 figure

Bubjects: Physics and Society (physics.soc-ph)
Cite as: w/0v.1007.00534 (physics.soc-ph)

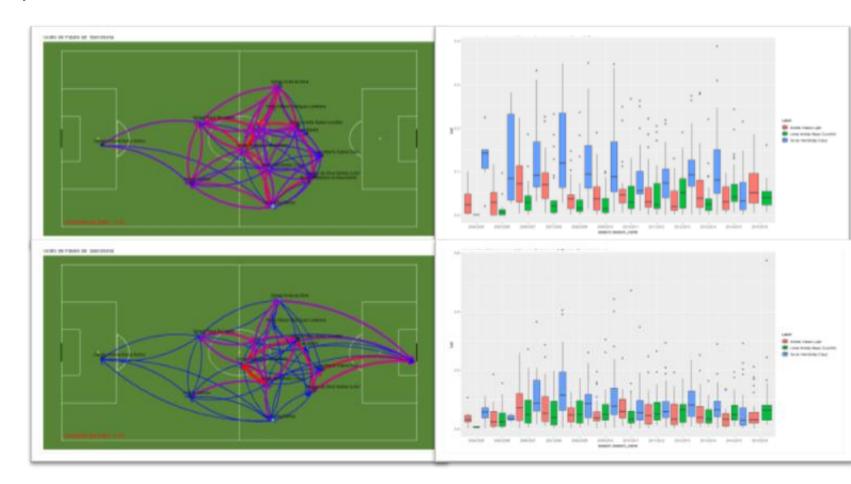
(or arXiv:1807.00534v3 [physics.soc-ph] for this version)



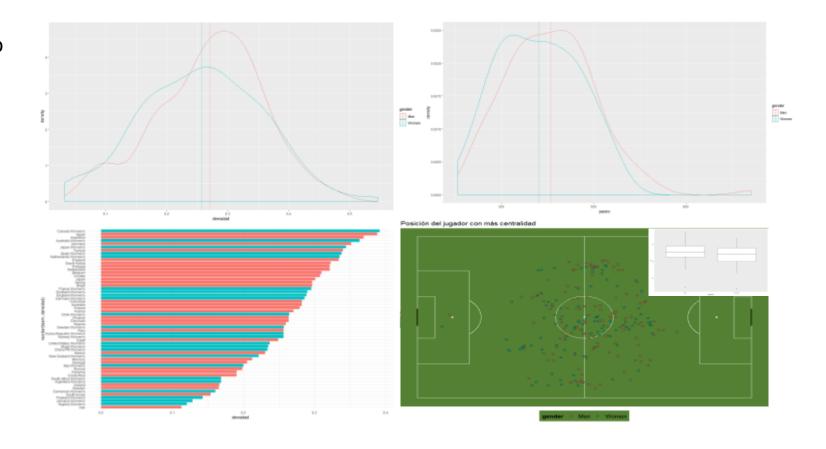
- Métricas y grafos, pase avanzado y *kmeans*
- Densidades
- Centralidad
- Fútbol Masculino vs Femenino



- Métricas y grafos, pase avanzado y kmeans
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- Métricas y grafos, pase avanzado y *kmeans*
- Densidades
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- Fútbol Masculino vs Femenino



SoccerGraph

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Even funcion prins al justo de passes para un espajo durante un parcolo cuando los passes son asservables.

Argumente

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7. Paquetes

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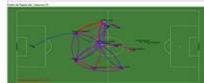
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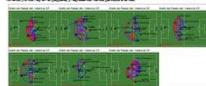
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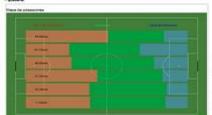
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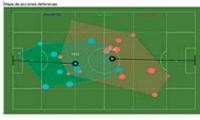
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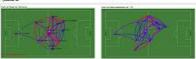
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Popularidariamente de los jugadores, liste mescos esta basado en los estudios de Manasano, Senarua e entuelo.

BY MAN DESIGNATION AND DESCRIPTION





FUTURAS MEJORAS

· POLICE UN HAPA CON BL. MODBLO NO GOUES ESPERACOS

Paquetes para iniciarse

- soccergraphR
- FootballBadges
- UnderstatPlots (próximamente)
- statsbombR
- FCrSTATS
- soccermatics
- ggsoccer





¡Muchas gracias!

16 NOVIEMBRE, 2019

Análisis de datos en el fútbol

library(soccergraphR) library(FootballBadges)

Jesús Lagos Milla



https://github.com/Jelagmil/

