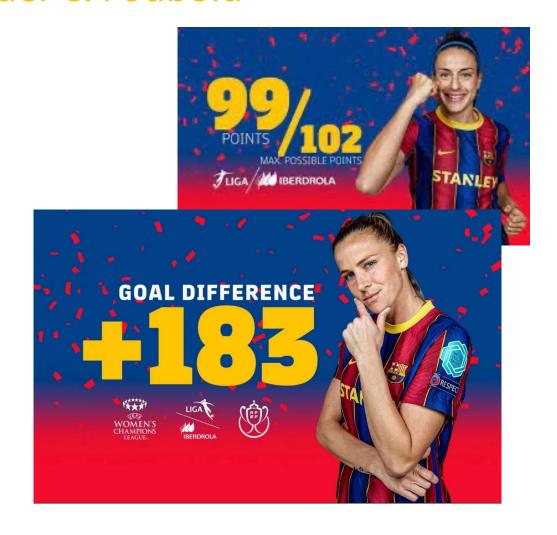


SPORTS ANALYTICS

Brøndby AS



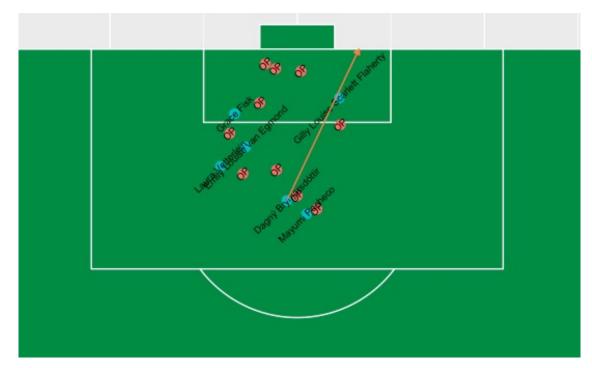
PRIMERA DIVISIÓN FEMENINA TABLE							
#	Team	MP	D	P			
1	Barcelona	27	+138	81			
2	Real Sociedad	27	+20	59			
3	Atlético Madrid	27	+37	53			
4	Real Madrid	27	+8	53			
5	Granadilla Ten	27	+2	53			

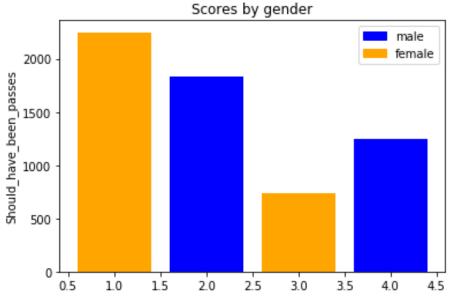


længden af afleveringer antal frispark antal skud antal lange afleveringer antal boldtab hastighed på skud

Agenda

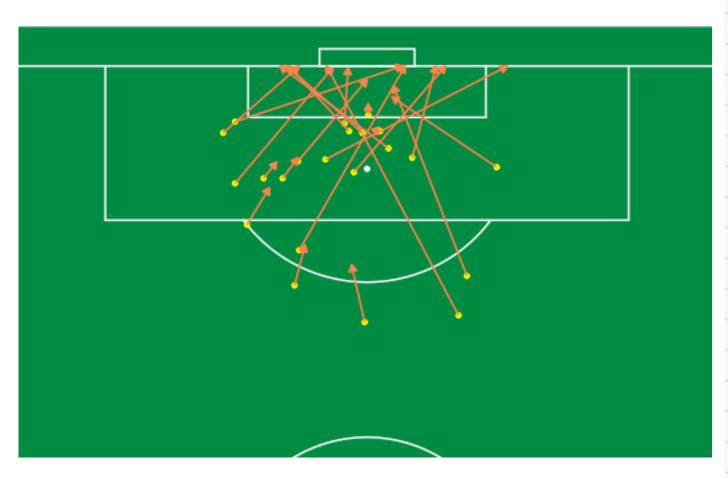
- Overview Statsbomb
 - lineups
 - events
 - matches
- Statsbomb i Mongo
 - import herrekampe
- Events shots
 - import fra statsbomb
 - all shots one match
 - one shot position
 - ggsoccer
 - all shots position and arrow
 - one shot freezeframe





```
shots <- data.frame(x = c(90, 85, 82, 78, 83, 74, 94, 91),
y = c(43, 40, 52, 56, 44, 71, 60, 54))
```

Plot all shots in one game

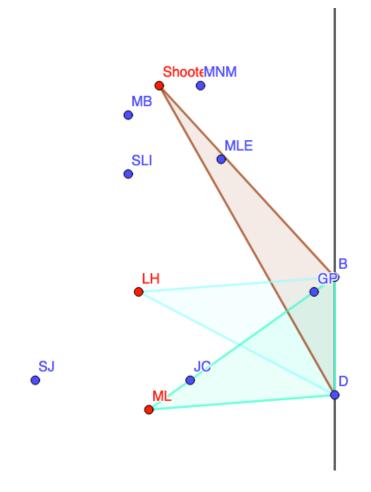


•	location [‡]	shot.end_location	-
1	c(113.3, 41.9)	c(119.8, 41.6, 1.6)	
2	c(112.2, 40.4)	c(120, 46.7, 1.6)	
3	c(110.4, 38.2)	c(120, 47.3, 1.3)	
4	c(106.3, 51.1)	c(119.8, 42.9, 1.3)	
5	c(112.2, 52.1)	c(120, 45.7, 0.2)	
6	c(98.5, 45.7)	c(120, 36.8, 1.2)	
7	c(112.4, 41.5)	c(120, 46.6, 1.5)	
8	c(90.1, 40.2)	c(96.8, 41.3)	
9	c(107.6, 41.1)	c(120, 33.4, 1.9)	
10	c(109.3, 36.2)	c(120, 34.2, 1.6)	
11	c(90.9, 32.3)	c(120, 43.4, 5.9)	
12	c(95.5, 31.6)	c(117.7, 37.8, 1.4)	
13	c(114.3, 39.9)	c(115.6, 39.9, 0.3)	
14	c(101.5, 50.1)	c(105.8, 48.2, 0)	
15	c(94.4, 46.1)	c(99.1, 45.2)	
16	c(112.4, 38.9)	c(112.6, 39.6)	

Find all non-teammates

For each teammate

compute number of nont in triangle



^	location	shot.end_location	shot.freeze_frame.location	shot.freez
1	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(98.5, 58.2)	TRUE
2	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(118.4, 42.8)	FALSE
3	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(111.8, 42.9)	TRUE
4	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(109.1, 43.8)	FALSE
5	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(106.9, 61.6)	FALSE
6	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(110.3, 52.5)	FALSE
7	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(112, 49.6)	FALSE
8	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(97.4, 56.1)	FALSE
9	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(106.9, 44.4)	TRUE
10	c(112.2, 52.1)	c(120, 45.7, 0.2)	c(115.3, 51.6)	FALSE

_	location [‡]	shot.end_location $^{\circ}$
1	c(112.2, 52.1)	c(120, 45.7, 0.2)

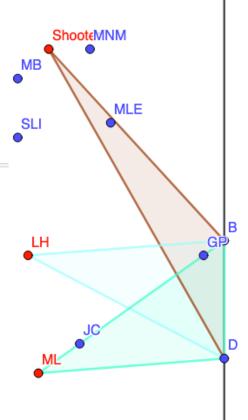
_	location [‡]	shot.end_location
1	112.2	120.0
2	52.1	120.0
3	112.2	45.7
4	52.1	45.7

Find all non-teammates

For each teammate

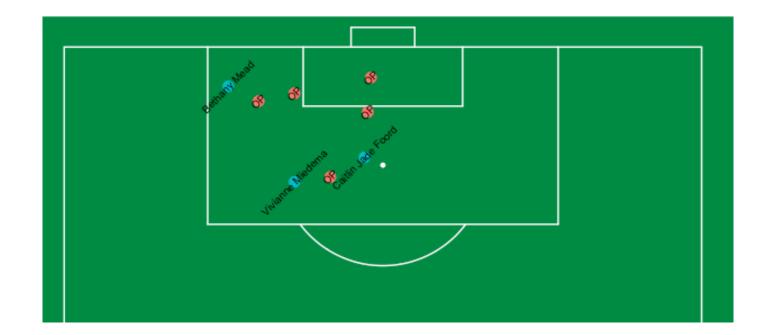
compute number of nont in triangle

*	location [‡]	player\$id [‡]	player\$name	position\$id ÷	position\$name	teammate [‡]
1	c(116, 59.4)	15619	Bethany Mead	12	Right Midfield	TRUE
2	c(108.8, 42.3)	11338	Caitlin Jade Foord	19	Center Attacking Midfield	TRUE
3	c(116.9, 41.5)	42787	Mackenzie Arnold	1	Goalkeeper	FALSE
4	c(115.3, 51.1)	31157	Hawa Cissoko	5	Left Center Back	FALSE
5	c(114.5, 55.6)	15724	Mayumi Pacheco	8	Left Wing Back	FALSE
6	c(113.4, 41.9)	34232	Grace Fisk	4	Center Back	FALSE
7	c(106.8, 46.6)	10124	Dagný Brynjarsdóttir	21	Left Wing	FALSE
8	c(110.6, 37)	18151	Gilly Louise Scarlett Flaherty	3	Right Center Back	FALSE



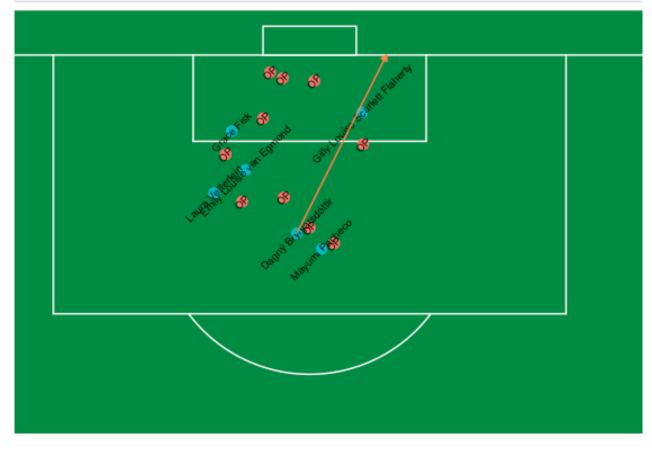
† team.nam	e [‡] player.name	position.id [‡]	shot.end_location [‡]	shot.outcome.name [‡]	shot.freeze_frame	÷
1 Arsenal W	C Vivianne Miedema	23	c(119.8, 42.9, 1.3)	Saved	1 variable	

	location	piayerşid	piayer\$name	positionaia	position\$name	teammate
1	c(116, 59.4)	15619	Bethany Mead	12	Right Midfield	TRUE
2	c(108.8, 42.3)	11338	Caitlin Jade Foord	19	Center Attacking Midfield	TRUE
3	c(116.9, 41.5)	42787	Mackenzie Arnold	1	Goalkeeper	FALSE
4	c(115.3, 51.1)	31157	Hawa Cissoko	5	Left Center Back	FALSE
5	c(114.5, 55.6)	15724	Mayumi Pacheco	8	Left Wing Back	FALSE
6	c(113.4, 41.9)	34232	Grace Fisk	4	Center Back	FALSE
7	c(106.8, 46.6)	10124	Dagný Brynjarsdóttir	21	Left Wing	FALSE
8	c(110.6, 37)	18151	Gilly Louise Scarlett Flaherty	3	Right Center Back	FALSE



•	team.name	player.name [‡]	location [‡]	shot.end_location $^{\scriptsize \scriptsize $	shot.outcome.name ÷	shot.freeze_frame	\$
1	West Ham United LFC	Dagný Brynjarsdóttir	c(107.6, 41.1)	c(120, 33.4, 1.9)	Off T	1 variable	

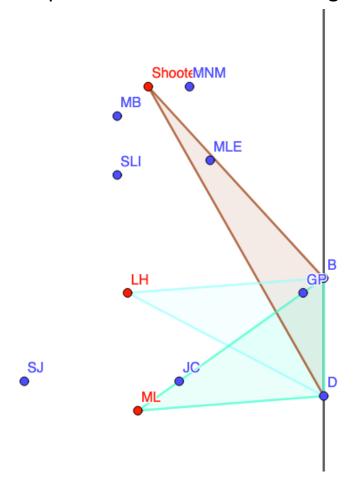
_	x	y	name	team [‡]	shooter
1	107.6	41.1	Dagný Brynjarsdóttir	TRUE	
2	106.9	37.9	OP	FALSE	2
3	118.4	42.3	OP	FALSE	2
4	109.8	45.8	OP	FALSE	2
5	113.1	47.2	OP	FALSE	2
6	115.6	44.0	OP	FALSE	2
7	118.8	43.4	OP	FALSE	2
8	110.1	42.2	OP	FALSE	2
9	113.8	35.4	OP	FALSE	2
10	118.2	39.6	OP	FALSE	2
11	108.0	40.0	OP	FALSE	2
12	112.0	45.5	Emily Louise van Egmond	TRUE	2
13	110.4	48.2	Laura Vetterlein	TRUE	2
14	116.0	35.5	Gilly Louise Scarlett Flaherty	TRUE	2
15	114.7	46.7	Grace Fisk	TRUE	2
16	106.5	39.0	Mayumi Pacheco	TRUE	2



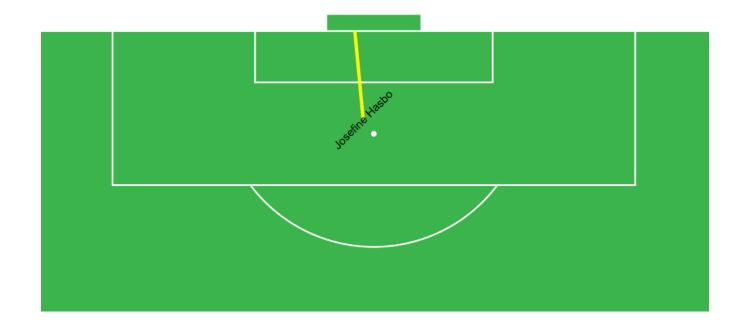
Find all non-teammates

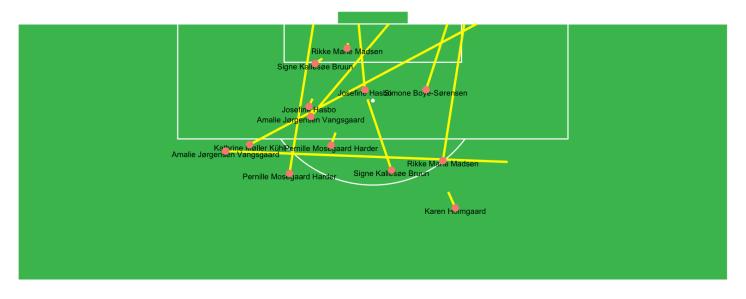
For each teammate

compute number of nont in triangle

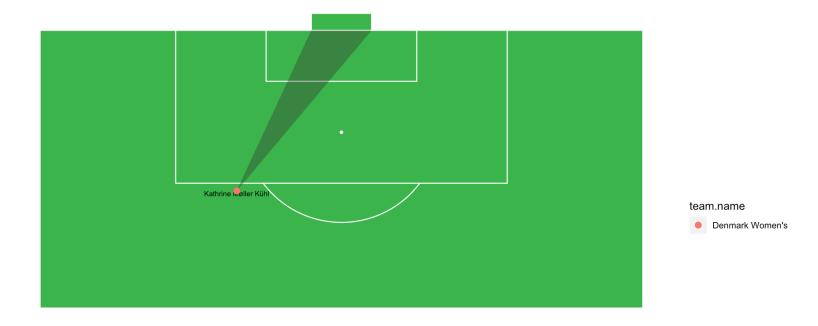


```
freeze_frame: [
   location: [ 102, 35 ],
   player: { id: 15547, name: 'Melissa Lawley' },
   position: { id: 24, name: 'Left Center Forward' },
   teammate: true
   location: [ 101, 43 ],
   player: { id: 15555, name: 'Lauren Hemp' },
   position: { id: 22, name: 'Right Center Forward' },
   teammate: true
   location: [ 118, 43 ],
   player: { id: 4640, name: 'Rut Hedvig Lindahl' },
   position: { id: 1, name: 'Goalkeeper' },
   teammate: false
   location: [ 109, 52 ],
   player: { id: 4633, name: 'Magdalena Lilly Eriksson' },
   position: { id: 5, name: 'Left Center Back' },
   teammate: false
   location: [ 100, 51 ],
   player: { id: 15549, name: 'Sophie Louise Ingle' },
   position: { id: 9, name: 'Right Defensive Midfield' },
   teammate: false
   location: [ 100, 55 ],
   player: { id: 4642, name: 'Millie Bright' },
   position: { id: 3, name: 'Right Center Back' },
   teammate: false
   location: [ 91, 37 ],
   player: { id: 4647, name: 'So-Yun Ji' },
   position: { id: 19, name: 'Center Attacking Midfield' },
   teammate: false
   location: [ 107, 57 ],
   player: { id: 10395, name: 'Maren Nævdal Mjelde' },
   position: { id: 11, name: 'Left Defensive Midfield' },
   teammate: false
   location: [ 106, 37 ],
   player: { id: 19422, name: 'Jessica Carter' },
   position: { id: 2, name: 'Right Back' },
   teammate: false
```







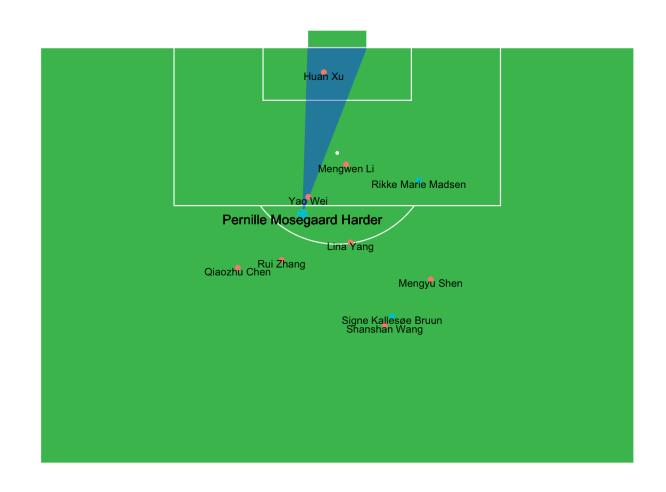


Lav denne Shiny-app ud fra Statsbombdata (Danmark-Kina). den skal indeholde flg commits:

- 1) ui-template
- 2) spiller-element populeret dynamisk
- 3) server-output med ggplot uden trekant
- 4) ui-element checkbox tilføjet
- 5) server-output med ggplot som afhænger af checkbox



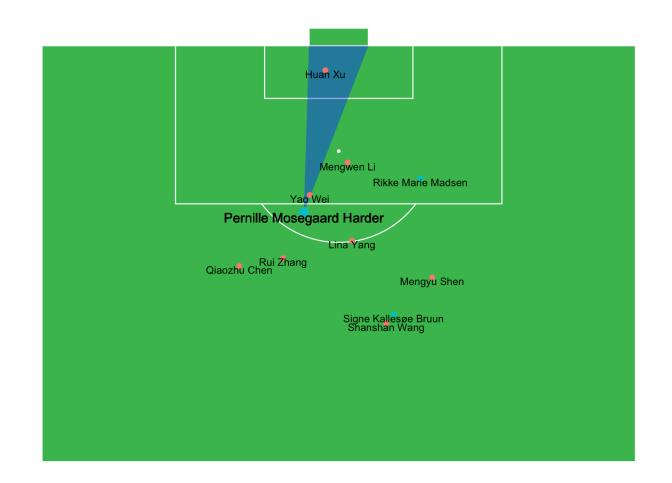
Kvinder & Fodbold Freeze Frame case





Lav en Shiny-app om freezeframen ud fra Statsbombdata (Danmark-Kina). den skal indeholde flg commits:

- 1) ui-template
- spiller-element populeret dynamisk
- server-output med ggplot uden trekant
- 4) ui-element checkbox tilføjet
- 5) server-output med ggplot som afhænger af checkbox



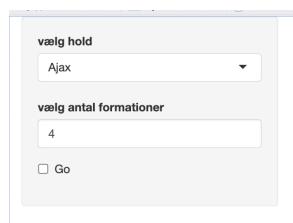
team.name

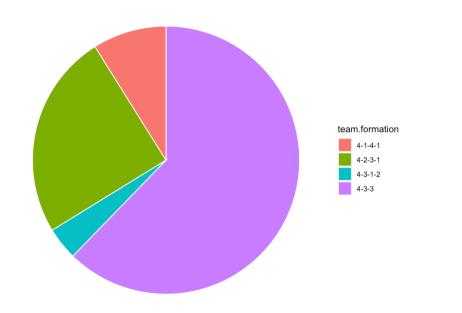
Denmark Women's

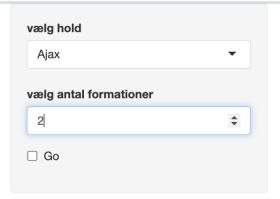
SHINY Øvelse - Piechart på 20 minutter

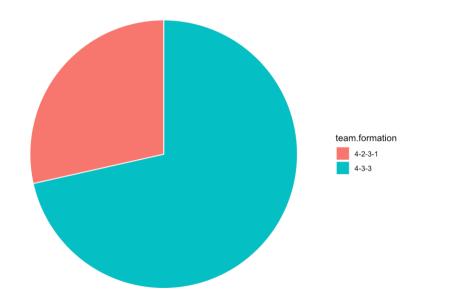
Lav denne Shiny-app ud fra WyScout-data (uden Go-knap). den skal indeholde flg commits:

- dataframe med formationshyppighed opregnet pr team
- 2) ui-template
- 3) ui-elementern populeret
- 4) server-output med ggplot









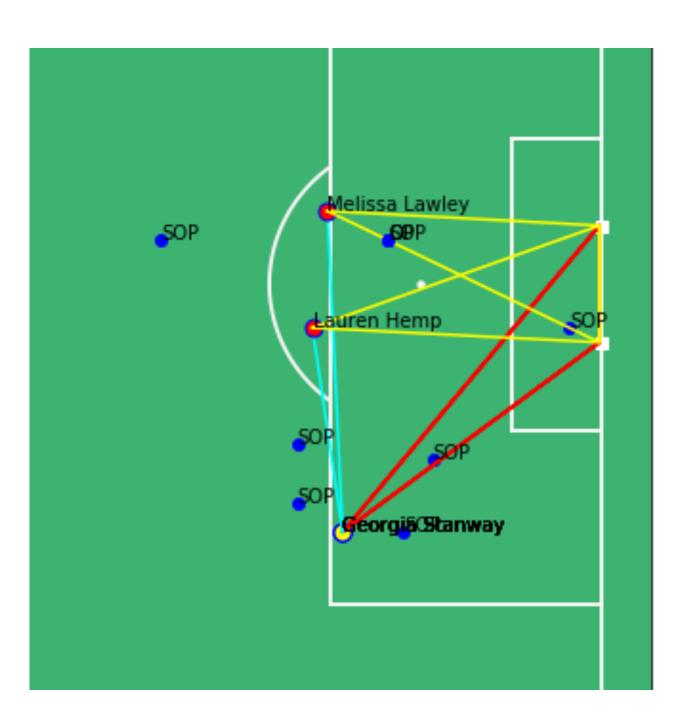
Kvinder & Fodbold Freeze-Frame

- Number of players in tri
- Distance of pass to teamplayer
- Distance to passline from opponent
- Teamplayer xG
 - Distance, angle

This frame:

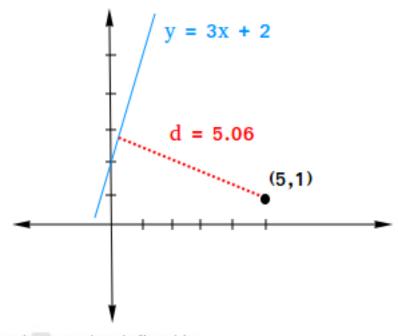
```
If for all team-others
shooter tri < other tri
AND
Other gdist < (shooter + tol)
AND
Passdist Shooter-Other-ratio > 0.2
Then
should have been a pass
```

Conlusion: Should have been a pass



Kvinder & Fodbold Freeze-Frame

• Distance to passline from opponent



If the problem is two-dimensional, the position of the points a, b and c can be defined by pairs of numbers which represent the points x and the y coordinates. The following function can be used to calculate the distance d of the point a from the line defined by the two points b and c:

```
dist2d <- function(a,b,c) {
  v1 <- b - c
  v2 <- a - b
  m <- cbind(v1,v2)
  d <- abs(det(m))/sqrt(sum(v1*v1))
}</pre>
```

Kvinder & Fodbold Freeze-Frame

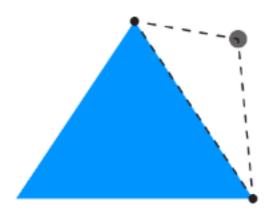
• Number of players in tri

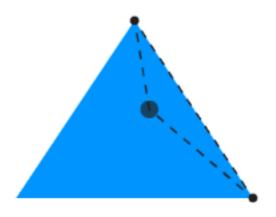


```
float areaOrig = abs( (x2-x1)*(y3-y1) - (x3-x1)*(y2-y1) );
```

We need to calculate the area of the three triangles made from the point as well:

```
float area1 = abs((x1-px)*(y2-py) - (x2-px)*(y1-py));
float area2 = abs((x2-px)*(y3-py) - (x3-px)*(y2-py));
float area3 = abs((x3-px)*(y1-py) - (x1-px)*(y3-py));
```

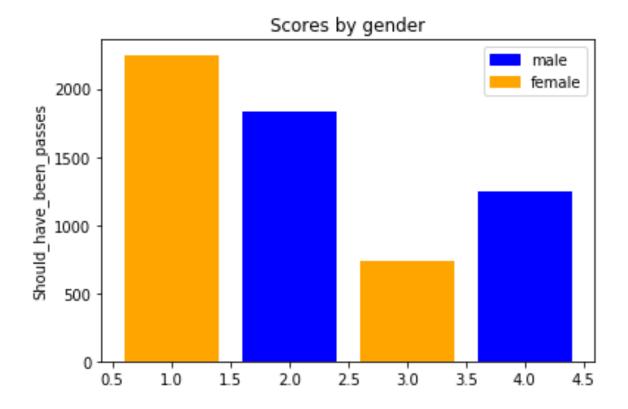




Bias ..

```
find({"type.name":"Shot", "gender":"female",
  "position.id" : {"$in":striker_player}})

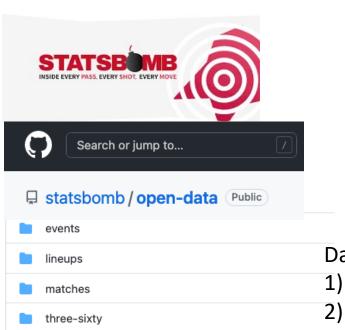
find({"type.name":"Shot", "gender":"male",
  "position.id" : {"$in":def_player}})
```



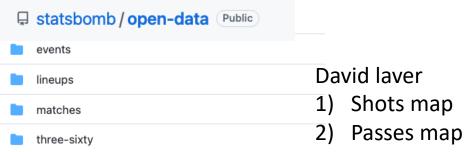
Statsbomb

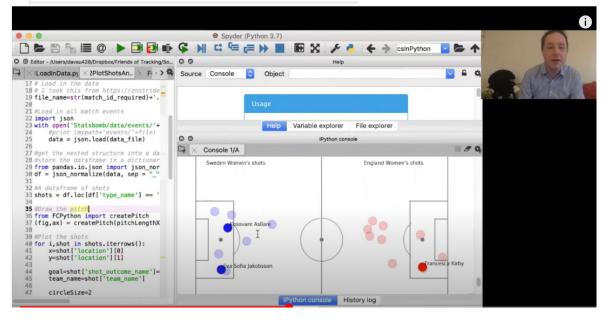


☐ Friends-of-Tracking-Data-FoTD / SoccermaticsForPython (Public)



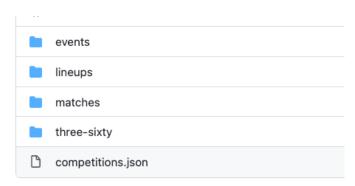
Sample event from 69301.json with 3291 events



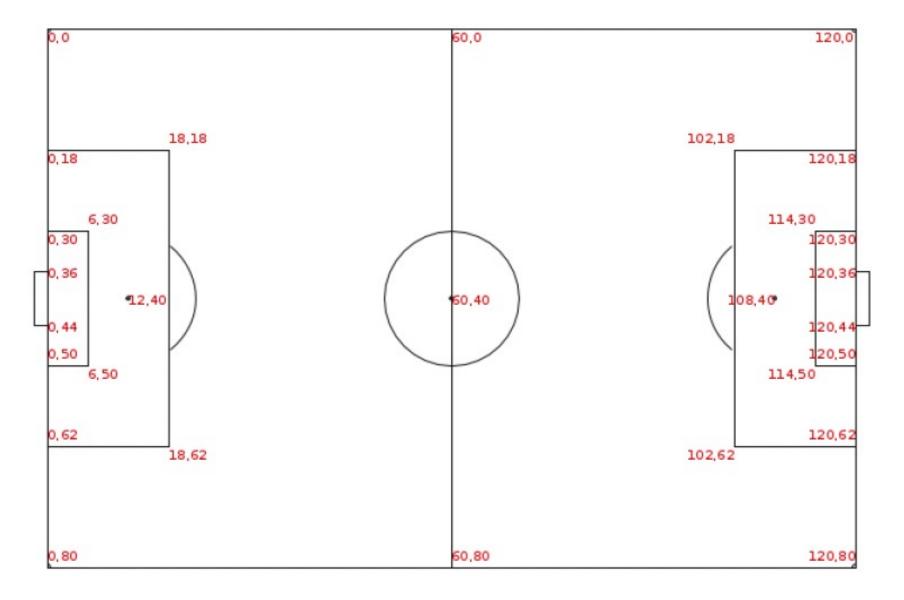


```
495 }, {
      id : ecec23b8-f03d-4bee-80df-9fabec558187,
      index: 9.
498
      period: 1,
      timestamp: 00:00:05.143,
      minute: 0,
501
      second: 5,
502
      type : {
503
        id: 30.
504
        name: Pass
505
506
      possession: 2.
      possession_team : {
508
        id: 865,
509
        name : England Women's
510
511
      play_pattern : {
512
        id: 9,
513
        name : From Kick Off
514
515
      team : {
516
        id: 865,
517
        name : England Women's
518
519
      player : {
520
        id: 4641.
521
        name: Francesca Kirby
522
      },
523
      position : {
524
        id: 15,
        name : Left Center Midfield
525
526
      location : [ 82.6, 37.6 ],
      duration : 1.173625,
529
      related_events : [ ebb46045-f1ab-4c25-88b8-fc7ea165b52d ],
530
      pass : {
531
       recipient : {
532
          id: 10178,
533
          name : Lucy Bronze
534
535
        length: 21.317833,
536
        angle: 1.7691119,
537
        height : {
538
          id : 1,
539
          name : Ground Pass
540
        end_location : [ 78.4, 58.5 ],
541
542
        body_part : {
543
         id: 40.
544
          name : Right Foot
545
546 _ }
```

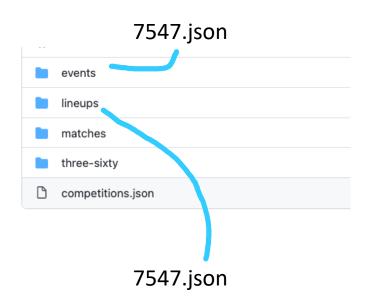


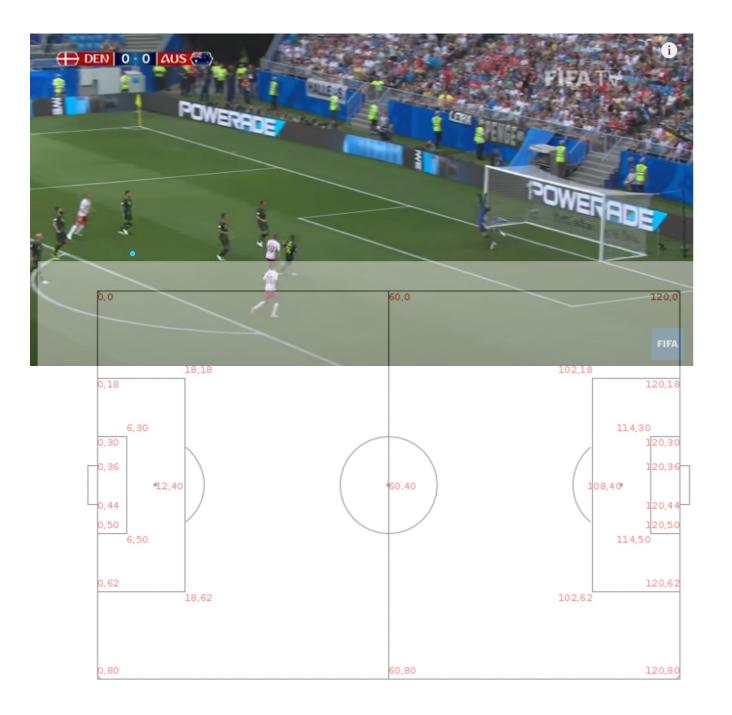














events

lineups

matches

three-sixty

```
id : b54f83ed-8ddb-4864-9b0b-ccc1f4f95da0.
                  index : 214,
                  period : 1,
                  timestamp: 00:06:07.640,
                  second: 7,
                  type : {
                    id: 16.
                    name : Shot
                  possession: 12,
                  possession team : {
                                                               DEN 0 0 AUS
                   id: 776,
                    name : Denmark
                  play_pattern : {
                    id: 4,
                    name : From Throw In
                  team : {
                    name : Denmark
                  player : {
                    id: 3043.
                    name : Christian Dannemann Eriksen
                  position : {
                    id: 19.
                    name : Center Attacking Midfield
                  duration: 0.6.
                  related_events : [ ef2b6ad0-caf8-47c8-b086-d252fc7834aa
competitions.
                    statsbomb_xg : 0.20277502,
                    end_location : [ 120.0, 37.8, 2.5 ],
                    key pass id: 9eac306c-fadb-4bf3-bcc2-592e03882bd5,
                    first time : true,
                    technique : {
                     id: 93.
                      name : Normal
                    type : {
                     id: 87,
                      name : Open Play
                      name : Goal
                    body_part : {
                      id: 38,
                      name : Left Foot
```

events — vim ego.json — 104×60

```
id : ef2b6ad0-caf8-47c8-b086-d252fc7834aa,
index : 215,
period: 1,
timestamp : 00:06:08.240,
minute: 6,
second: 8,
type : {
 id: 23,
 name : Goal Keeper
possession team
 id: 3240,
related events : [ b54f83ed-8ddb-4864-9b0b-ccc1f4f95da0 ],
goalkeeper : {
 technique : {
   id: 45,
   name : Diving
 type : {
   id : 26,
   name : Goal Conceded
 outcome : {
   id: 55,
   name: No Touch
 position : {
   name : Set
```

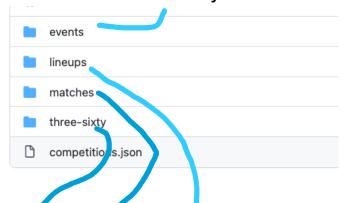


Three-sixty folderen rummer trackingdata for 51 kampe.

Desværre ikke for DK's kampe. 3788753 er Rusland vs Finland



3788753.json har ca 3800 events



3788753.json opstillingen for de to hold

55/43.json has a record for matchid 3788753 (and 49 other games)

3788753.json has the tracking of that match



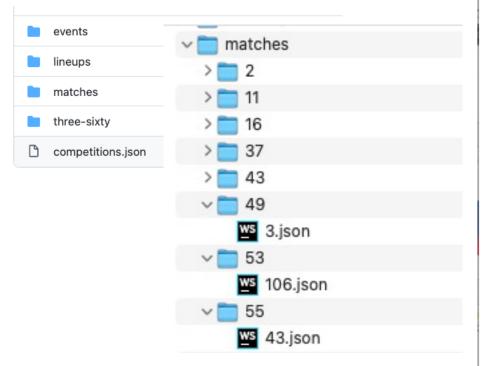
events
lineups
matches
three-sixty
competitions.json

Lineups

```
=> jq '.[1].lineup[9]' 3788753.json
"player_id": 15416,
"player_name": "Jukka Raitala",
"player_nickname": null,
"jersey_number": 22,
"country": {
  "id": 77,
  "name": "Finland"
},
"cards": [],
"positions": [
    "position_id": 7,
    "position": "Right Wing Back",
    "from": "00:00",
    "to": "74:26",
    "from_period": 1,
    "to_period": 2,
    "start_reason": "Starting XI",
    "end_reason": "Substitution - Off (Tactical)"
```



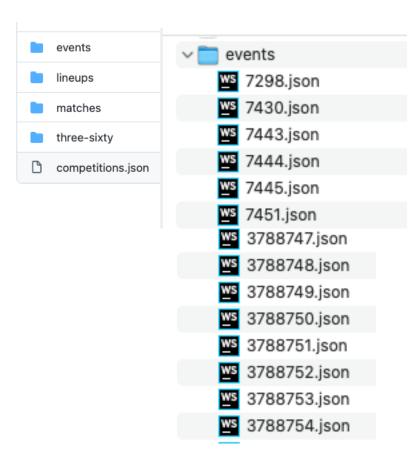
Filen 43.json med 51 kampe



```
2295
2296 }, {
2297
       match_id: 3788753,
2298
       match_date : 2021-06-16,
       kick_off: 15:00:00.000,
2299
       competition : {
2300
2301
         competition_id : 55,
2302
         country_name : Europe,
2303
         competition_name : UEFA Euro
2304
       season : {
2305
2306
         season_id : 43,
2307
         season_name : 2020
2308
       },
2309
       home_team : {
                                     2000
                                             macon_wook . 4.
2310
         home_team_id : 1835,
                                     2361
                                            competition_stage : {
2311
         home_team_name : Finland,
                                     2362
                                              id : 10.
2312
         home_team_gender : male,
                                     2363
                                               name : Group Stage
2313
         home_team_group : Group B,
                                     2364
2314
         country : {
                                             stadium : {
                                     2365
2315
           id : 77,
                                     2366
                                               id: 4726,
2316
           name : Finland
                                     2367
                                               name : Saint-Petersburg Stadium,
2317
                                     2368
                                               country : {
2318
         managers : [ {
                                     2369
                                                 id : 188,
2319
           id : 3622,
                                     2370
                                                 name : Russia
           name : Markku Kanerva,
2320
                                     2371
           nickname : null,
2321
2322
           dob: 1964-05-24,
                                     2372
                                     2373
                                            referee : {
2323
           country : {
2324
             id : 77,
                                     2374
                                               id : 293,
2325
             name : Finland
                                     2375
                                               name : Danny Desmond Makkelie,
2326
                                     2376
                                               country : {
2327
                                     2377
                                                 id : 160,
2328
                                     2378
                                                 name : Netherlands
2329
       away_team : {
                                     2379
2330
         away_team_id : 796,
                                     2380
2331
         away_team_name : Russia,
                                     2381
2332
         away_team_gender : male,
         "away_team_group" : "Group B",
2334
         country . {
```



3788753.json indeholder 3806 events for kampen Rusland – Finland.



```
1 "Tactical Shift"
   2 "50/50"
   2 "Referee Ball-Drop"
   2 "Starting XI"
   3 "Player Off"
   3 "Player On"
   4 "Half End"
   4 "Half Start"
    "Substitution"
  14 "Injury Stoppage"
  19 "Dispossessed"
  20 "Dribbled Past"
  25 "Shot"
  26 "Interception"
  26 "Miscontrol"
  27 "Foul Won"
  28 "Foul Committed"
  28 "Goal Keeper"
  34 "Block"
  34 "Dribble"
  67 "Clearance"
  86 "Duel"
 108 "Ball Recovery"
 355 "Pressure"
 841 "Carry"
1001 "Ball Receipt*"
1038 "Pass"
```



3788753.json – eksempel på skud-event.

907

937

id: 7aa54ce6-106a-4e26-9fb1-77aa0d7

shot: {

```
908
                                                                                statsbomb_xg: 0.014892562,
                                          864
                                                                       909
                                                                                end_location: [
                                          865
                                                                                   120,
                                          866
                                                id: 1ce72d1b-a7c5-4eb
                                                                       911
                                                                                   30.9,
                                                index: 865,
                                          867
                                                                       912
                                                                                   5.9
                                          868
                                                period: 1,
events
                                                                       913
                      events
                                                timestamp: 00:20:38.7
                                          869
                                                                                key_pass_id: e8a6376e-ba9d-49d
                                                minute: 20,
                                                                       914
                                          870
  lineups
                      ws 7298.json
                                                                                body_part: {
                                          871
                                                second: 38,
                                                                       915
                                                type: {
                      ₩ 7430.json
                                          872
  matches
                                                                       916
                                                                                  id: 37,
                                          873
                                                  id: 16.
                                                                       917
                                                                                   name: Head _ _____
                      ₩ 7443.json
  three-sixty
                                          874
                                                  name: Shot
                                                                       918
                                                                                                1158
                                          875
                      ₩ 7444.json
                                                                       919
                                                                                                1159
                                                                                                              location: [
                                                                                type: {
competitions.json
                                          876
                                                possession: 38,
                                                                                                1160
                                                                       920
                                                                                   id: 87
                                                                                                                111.7,
                         7445.json
                                                possession_team: {
                                          877
                                                                       921
                                                                                                                36.2
                                                                                   name: Open
                                                                                              1161
                                          878
                                                  id: 1835,
                      ₩s 7451.json
                                                                       922
                                                                                                1162
                                          879
                                                  name: Finland
                         3788747.json
                                                                       923
                                                                                aerial_won:
                                                                                                1163
                                                                                                              player: {
                                          880
                                                                                                1164
                                                                       924
                                                                                technique: {
                                                                                                                id: 38196,
                                                play_pattern: {
                                          881
                         3788748.json
                                                                                                                name: Daniel O''Shaughnessy
                                                                       925
                                                                                                1165
                                                                                   id: 93.
                                          882
                                                  id: 2,
                         3788749.json
                                          883
                                                                       926
                                                                                  name: Norma 1166
                                                  name: From Corner
                                          884
                                                                       927
                                                                                                1167
                                                                                                              position: {
                      ws 3788750.json
                                          885
                                                team: {
                                                                       928
                                                                                                1168
                                                                                outcome: {
                                                                                                                id: 5.
                      ws 3788751.json
                                                  id: 1835,
                                          886
                                                                       929
                                                                                   id: 98.
                                                                                                1169
                                                                                                                name: Left Center Back
                                          887
                                                  name: Finland
                                                                                               1170
                                                                       930
                                                                                   name: Off
                      ws 3788752.json
                                          888
                                                                       931
                                                                                                1171
                                                                                                              teammate: true
                      ws 3788753.json
                                          889
                                                player: {
                                                                       932
                                                                                 freeze_frame: 1172
                                          890
                                                  id: 26939,
                      Ws 3788754.json
                                                                       933
                                                                                                1173
                                          891
                                                  name: Joona Toivio
                                                                       934
                                                                                     location: 1174
                                          892
                                                                       935
                                                                                       112.7,
                                                                                                1175
                                                                                       42
                                                                       936
                                                                                                1176
```