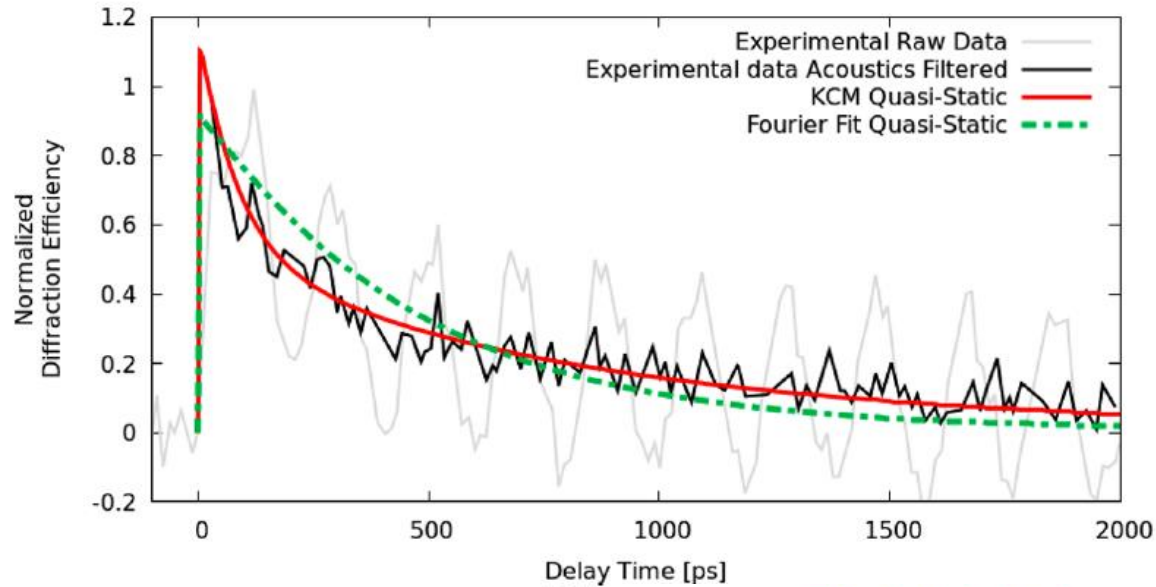
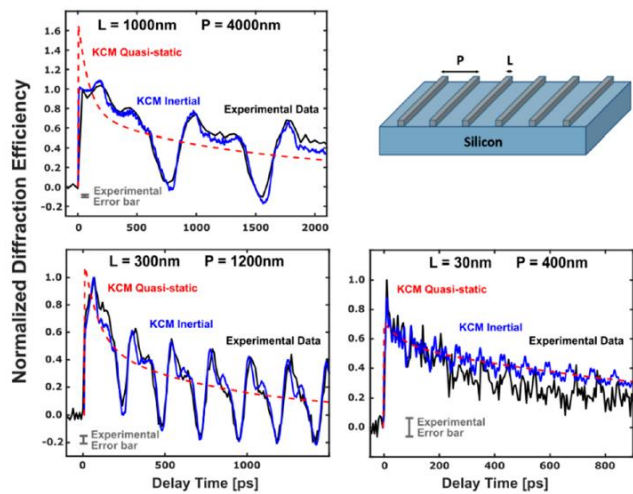


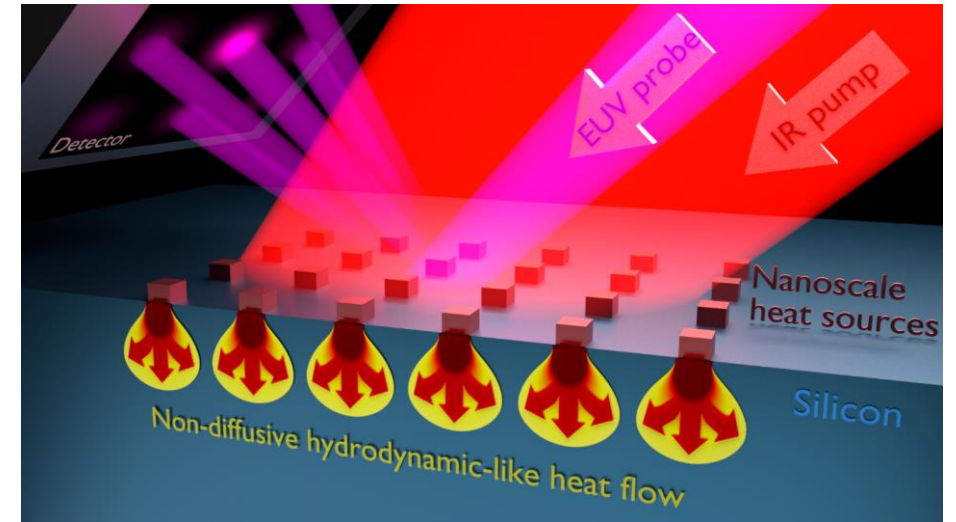
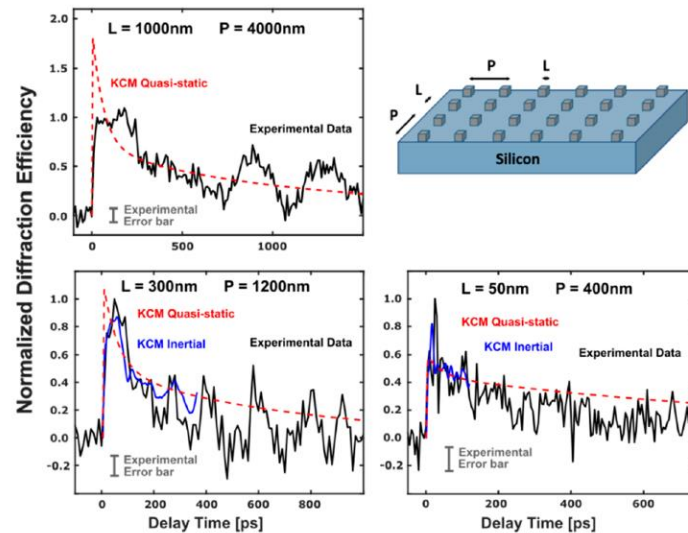
**CIÈNCIA I LA CORDA BLAVA,
UN BINOMI AMB MOLTA FORÇA**



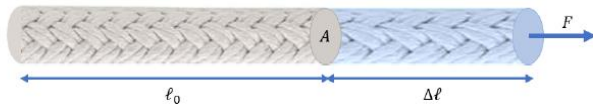
a Effectively isolated nanolines



b Effectively isolated nanodots



Mòdul de Young



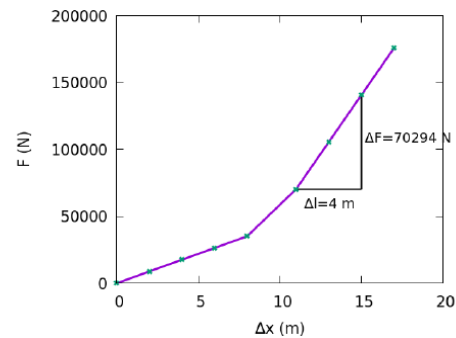
Comencem per la llei de Hooke i la reescrivim incloent A i l_0

$$F = -k\Delta l$$

$$\frac{F}{A} = -\frac{k l_0}{A} \frac{\Delta l}{l_0}$$

Llei de Hooke

Elongació $l \equiv \Delta x$ (m)	Força F (N)
0	0
8	35147
11	70294
13	105441
15	140588
17	175735



Mòdul de Young



Elongació $l \equiv \Delta x$ (m)	Força F (N)
0	0
4	17574
8	35148

$l_0 = 100$ m ; $r = 2$ cm ; $A = \pi \cdot 0.02^2$ m²
Tensió

$$\sigma = \frac{F}{A} = \frac{35148}{\pi \cdot 0.02^2} = 2.8 \cdot 10^7 \text{ Pa}$$

Deformació Unitària

$$\epsilon = \frac{\Delta l}{l_0} = \frac{8}{100} = 0.08$$

Mòdul de Young

$$E = \frac{4396 \cdot 100}{\pi \cdot 0.02^2} = 3.5 \cdot 10^8 \text{ Pa}$$

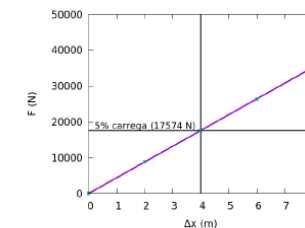
Llei de Hooke

El cas més senzill és una relació lineal ($F \propto \Delta x$), anomenada

Llei de Hooke:

$$F = -k\Delta x$$

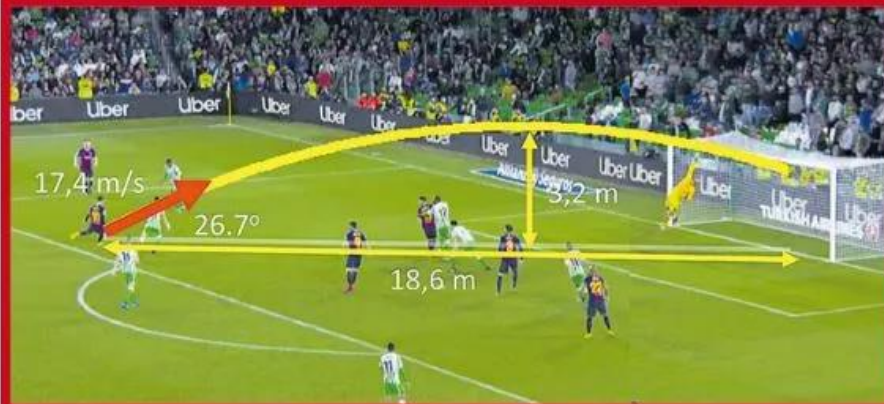
on k s'anomena constant elàstica de la molla







EL GOL PERFECTO



La vaselina antológica de Messi en el Villamarín pasará a la historia como uno de los mejores goles del campeonato

INFORME SPORT

Analizamos con un físico el tanto de Leo: su golpeo es impecable

FÚTBOL QUIERE SALIR DEL ATLÉTICO

GRIEZMANN SE PONE EN EL MERCADO



FÚTBOL LE PODRÍA CAER UNA MULTA

LA UEFA INVESTIGA A CRISTIANO



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Barça

Así explica la ciencia el gol de Messi

- Francesc Xavier Álvarez, profesor de Física de la UAB, analiza todos los detalles del gol de Messi ante el Betis
- Messi le dio la velocidad y la inclinación precisas. "Ese gol se marcó así y no se podía marcar de otra forma", resume el físico



El gol no fue solo perfecto visualmente, también lo fue matemáticamente. Francesc Xavier Álvarez nos explica por qué | Laia Cervelló

Publicidad



UAB
Universitat Autònoma
de Barcelona

2

MOTIVACIÓ

Interès per l'activitat des del punt de vista de la Física



1991	1992	1993	1994	1995
1996	1997	1998	1999	2000
2001	2002	2003	2004	2005
2006	2007	2008	2009	2010
2011	2012	2013	2014	2015
2016	2017	2018		

Curiositat pels resultats

Autoestima com a **BLAU**



Interès des del punt de vista dels
Sistemes complexos





ELS PROTAGONISTES



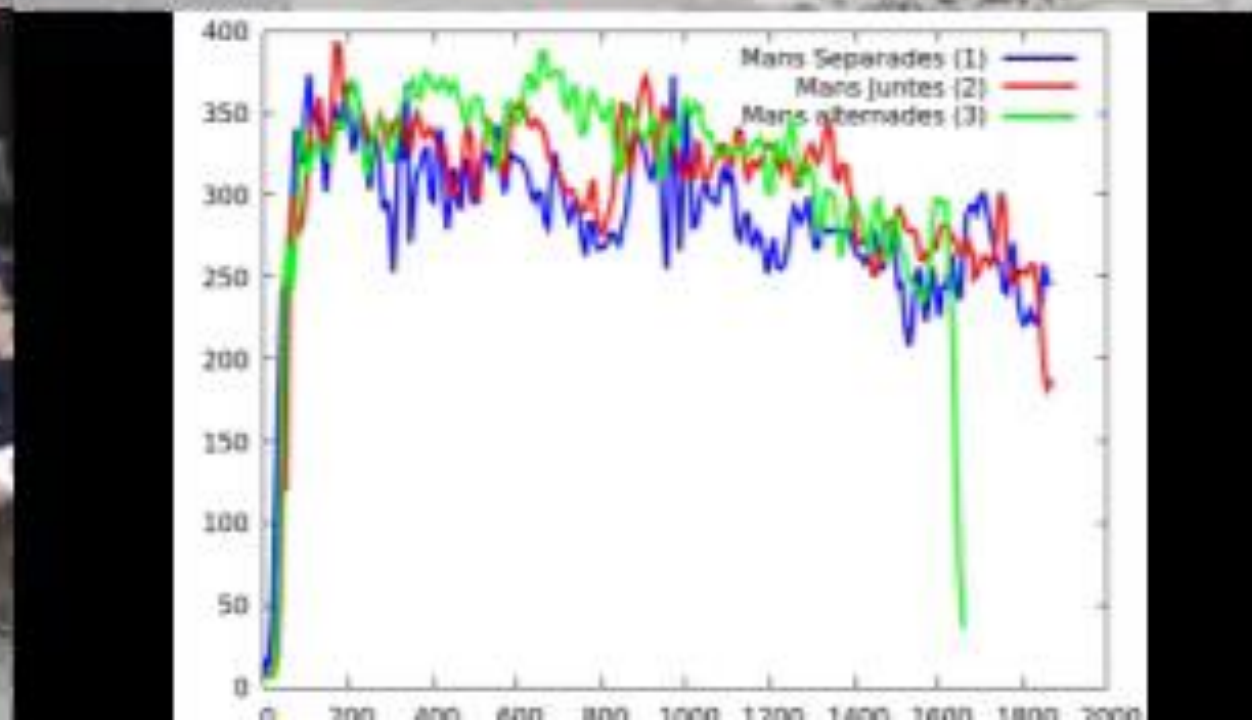
Treball en equip

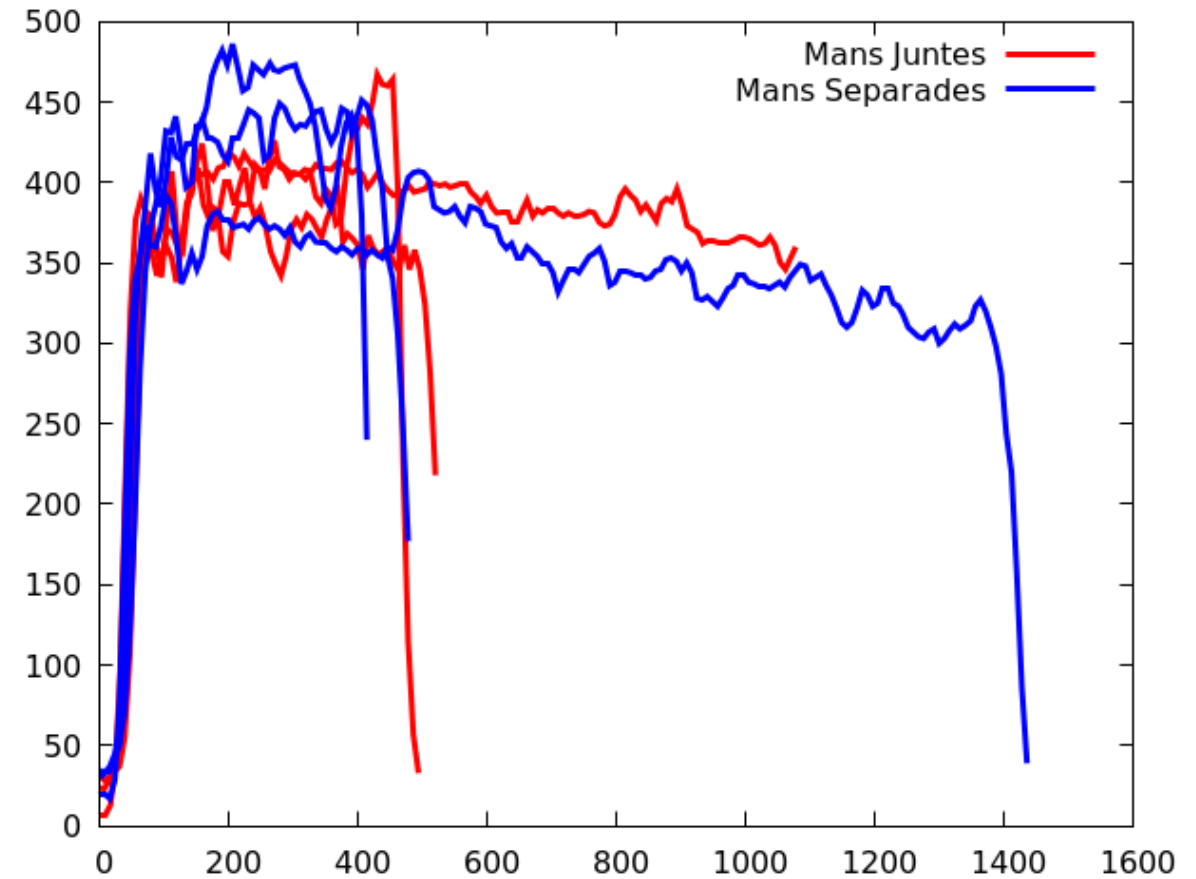
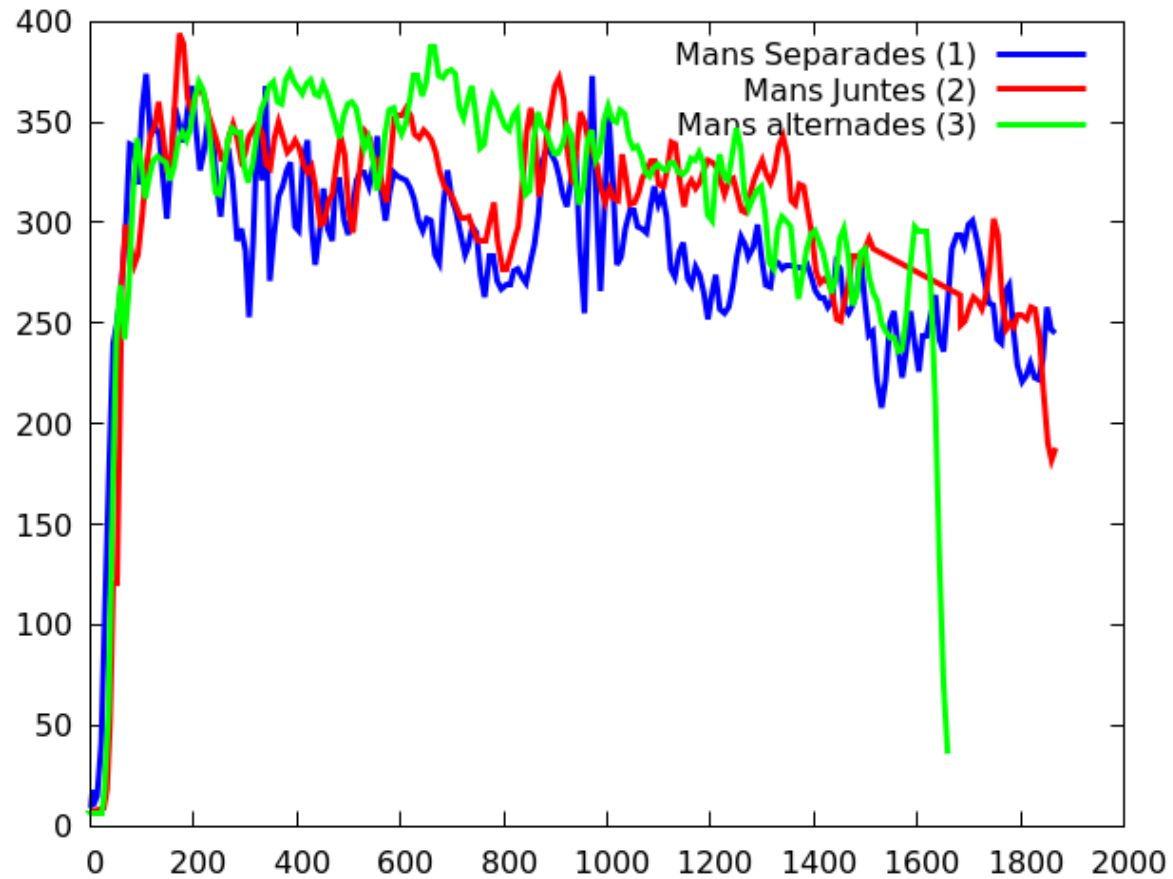


La corda blava aporta l'experiència del camp

El científic tan sols aporta el mètode científic

Hi ha un diàleg fluid entre les parts





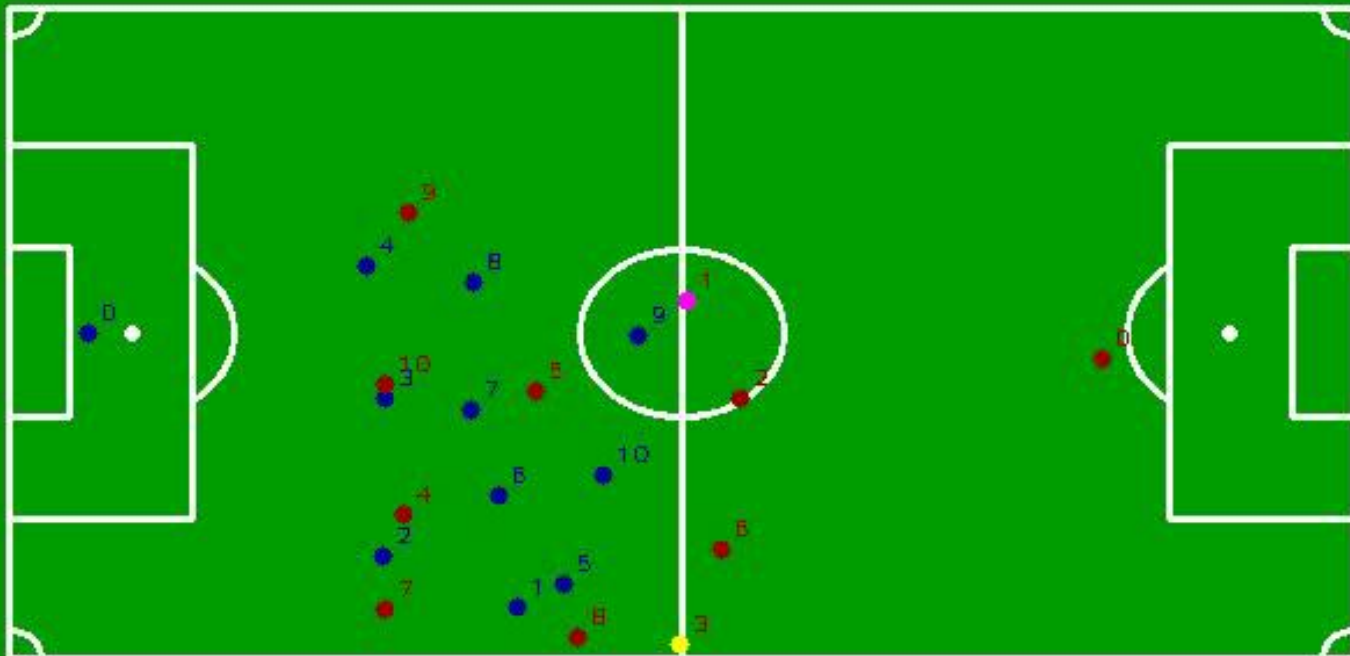
1991	1992	1993	1994	1995
1996	1997	1998	1999	2000
2001	2002	2003	2004	2005
2006	2007	2008	2009	2010
2011	2012	2013	2014	2015
2016	2017	2018	2019	2020
2021	2022			

6

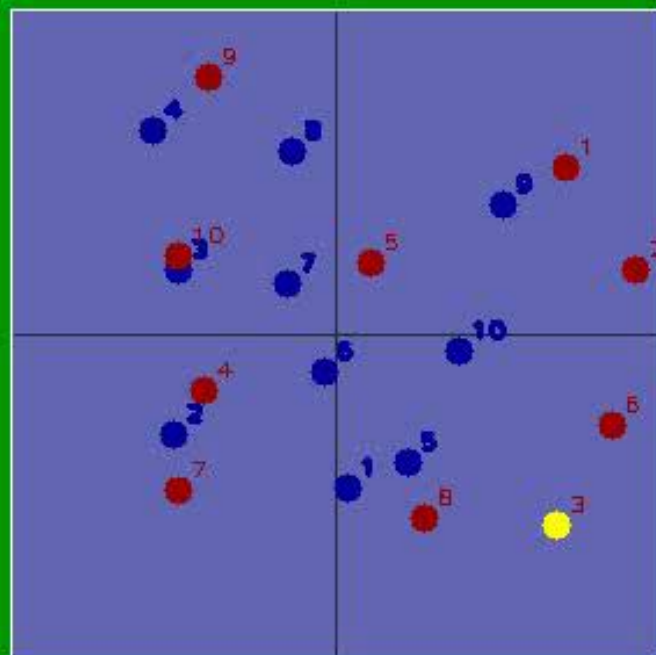
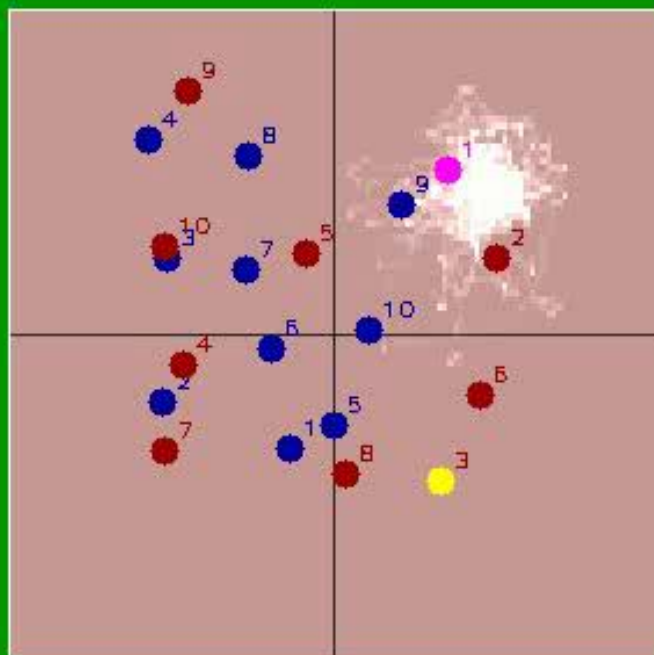
I A PARTIR D'ARA QUÈ?



TRACKING DATA ANALYSIS



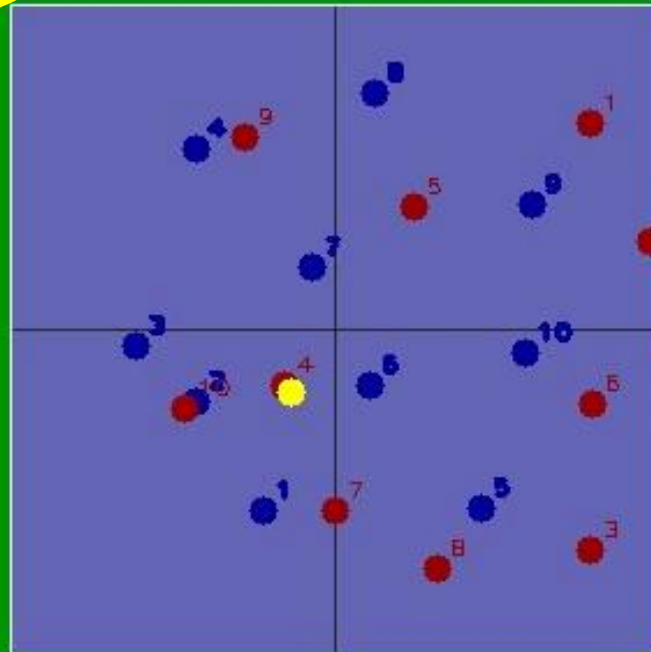
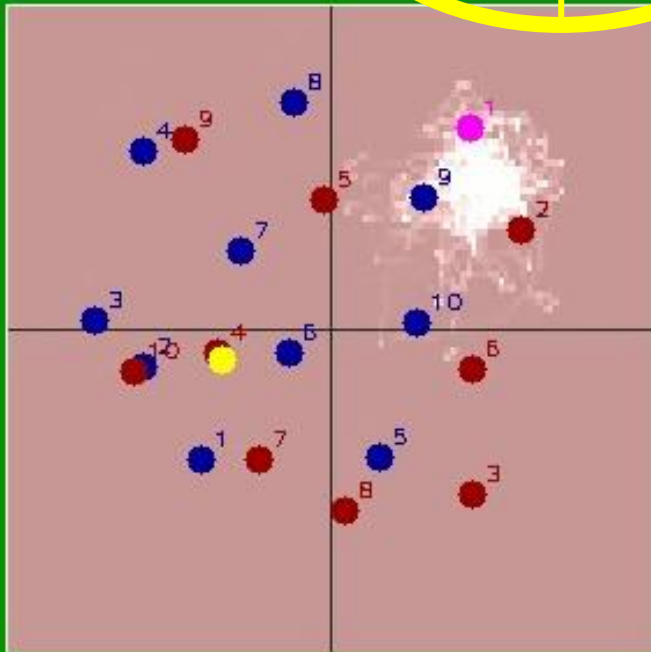
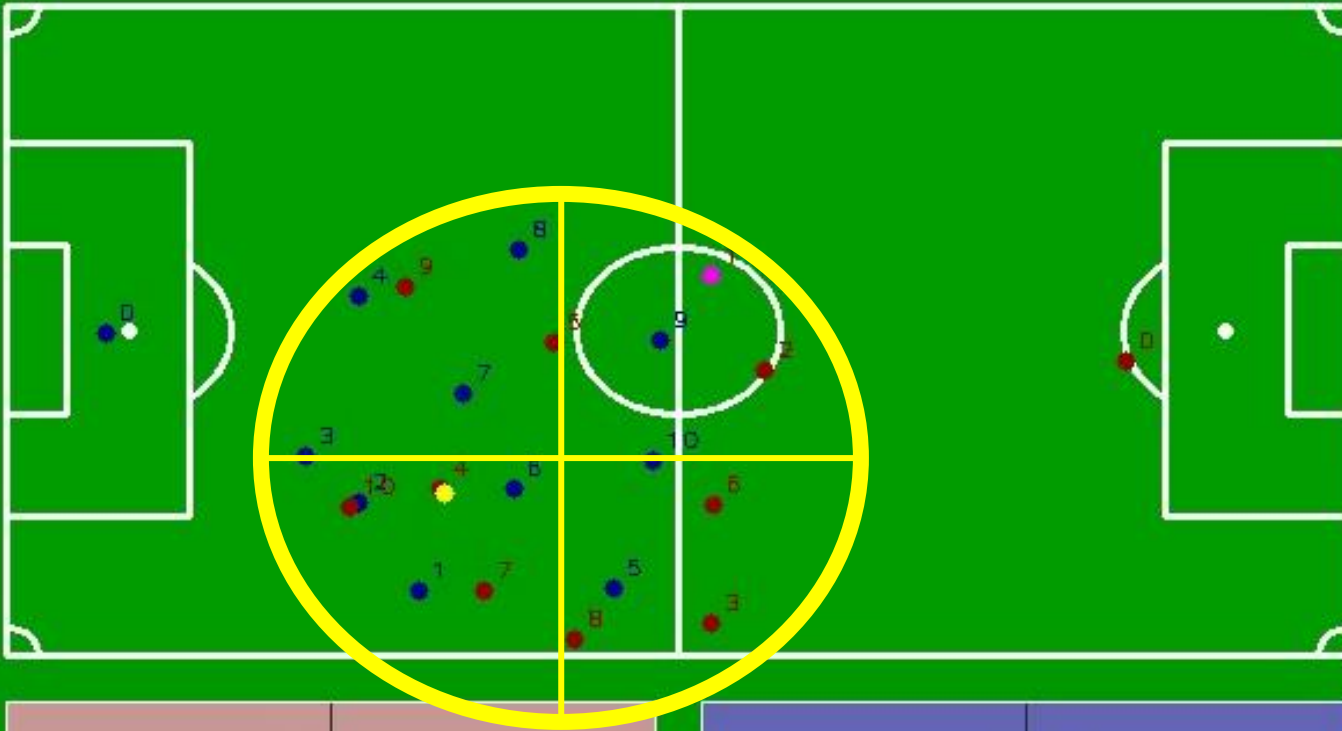
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TIME: 00:12 (314)
SECONDS: 12.56
FRAME: 314
POSSESSION:
Away
SCORE:
H: 0 A: 0
EV: PASS
S_EV:



TRACKING DATA ANALYSIS

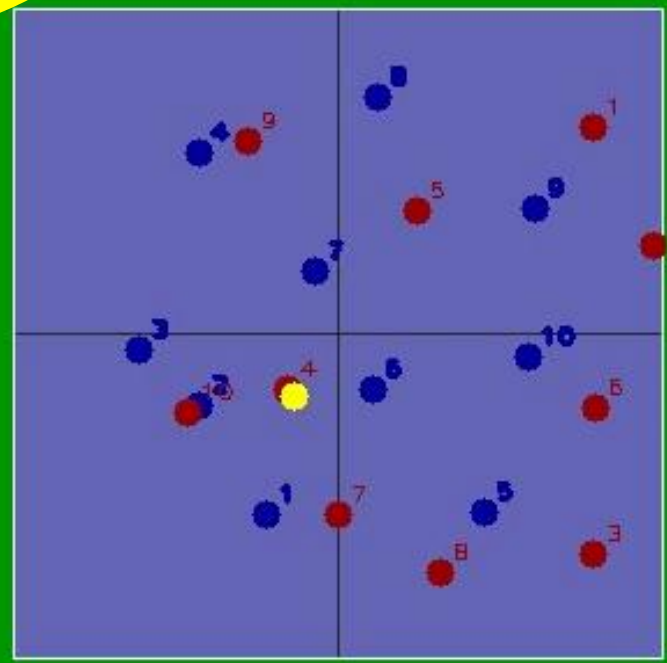
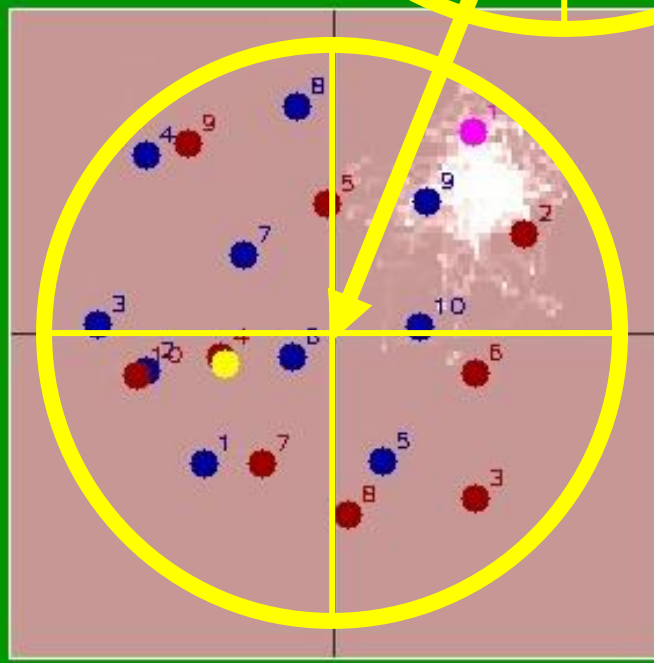
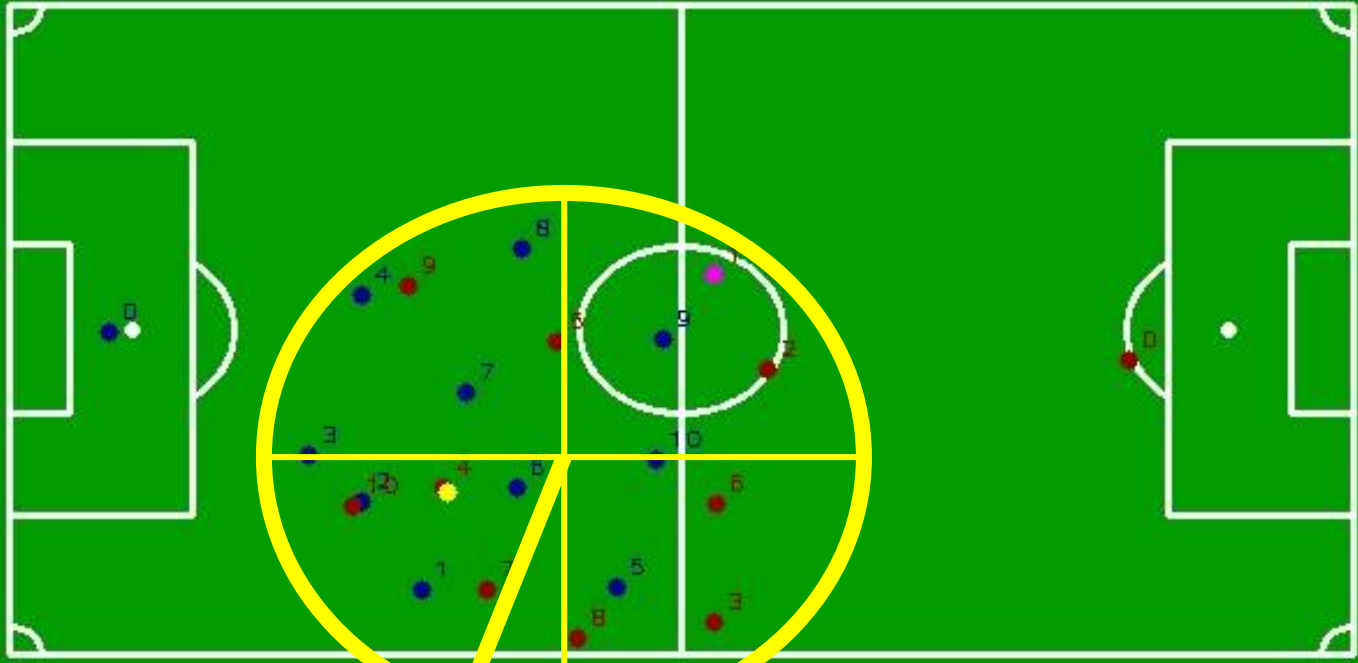
PERIOD: 1
TIME: 00:15 (392)
SECONDS: 15.68
FRAME: 392
POSSESSION:
Home
SCORE:
H: 0 A: 0
EV: BALL LOST
3_EV: INTERCEPTION

Calculation of center of Mass and variance of the player's distribution



TRACKING DATA ANALYSIS

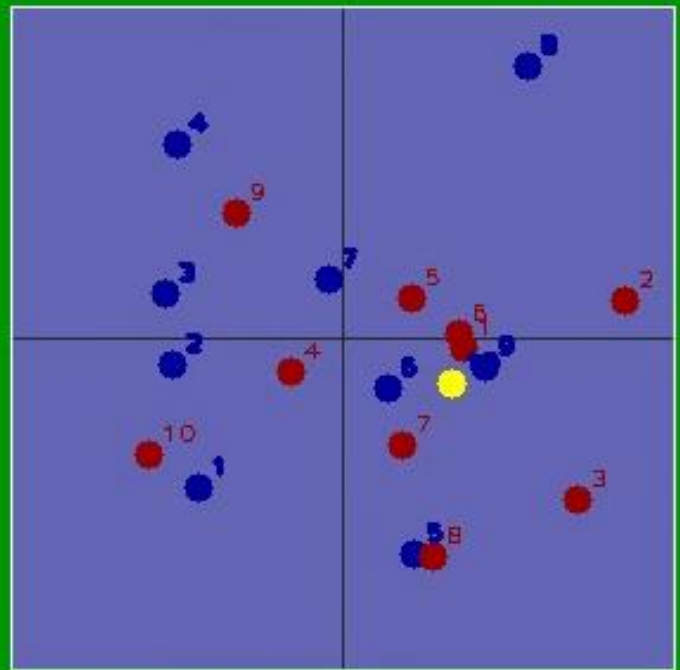
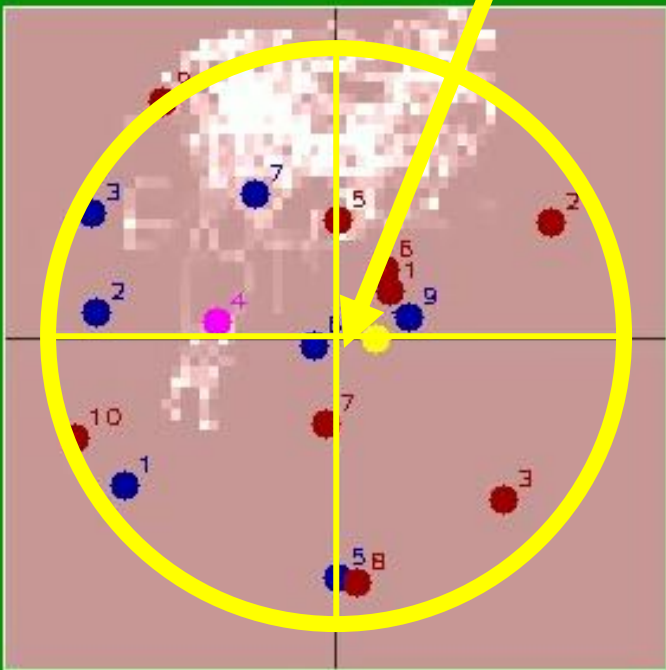
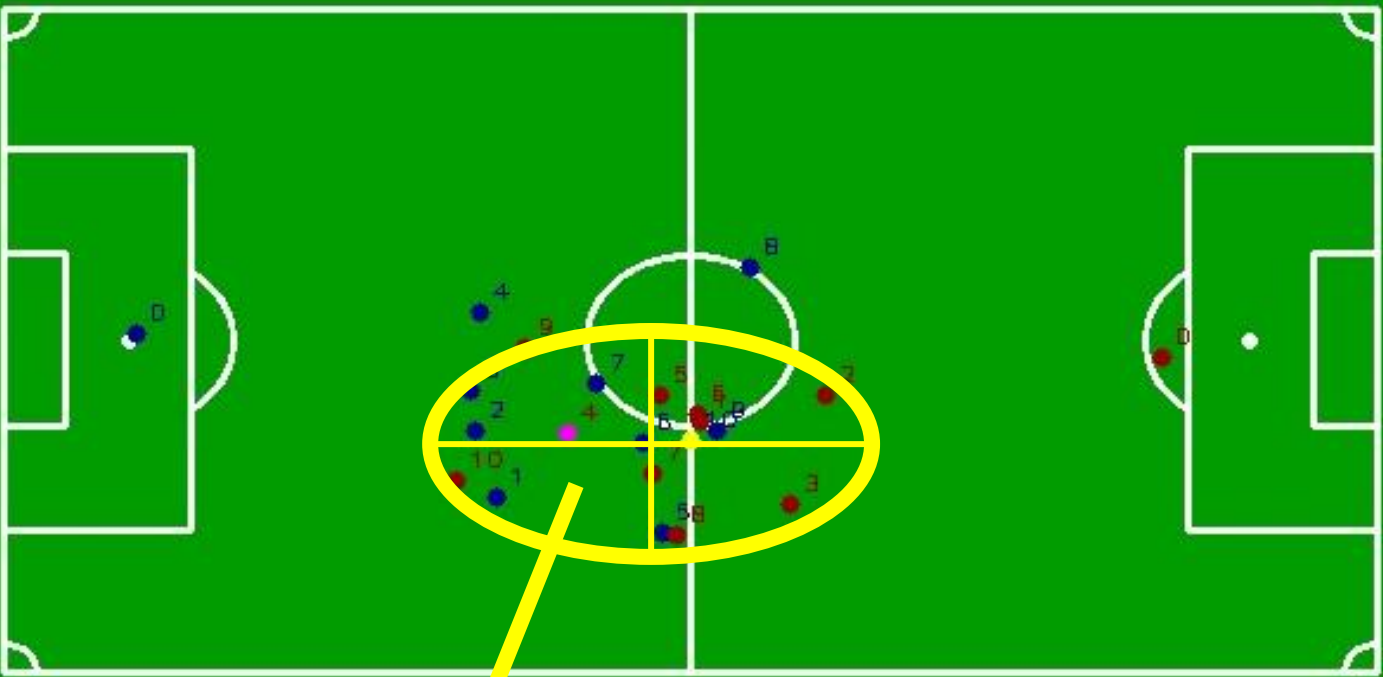
PERIOD: 1
TIME: 00:15 (392)
SECONDS: 15.68
FRAME: 392
POSSESSION:
Home
SCORE:
H: 0 A: 0
EV: BALL LOST
3_EV: INTERCEPTION



Translation and renormalization

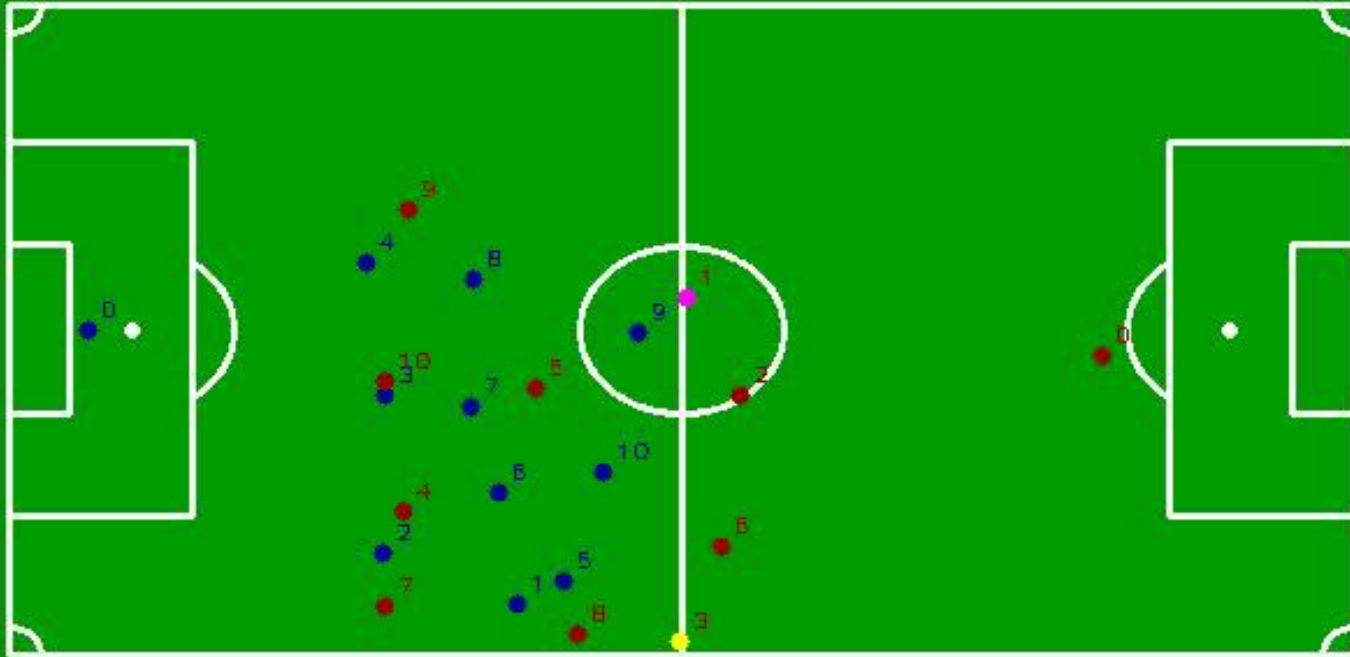
TRACKING DATA ANALYSIS

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POSSESSION:
Home
SCORE:
H: 0 A: 0
EV: PASS
g_EV:



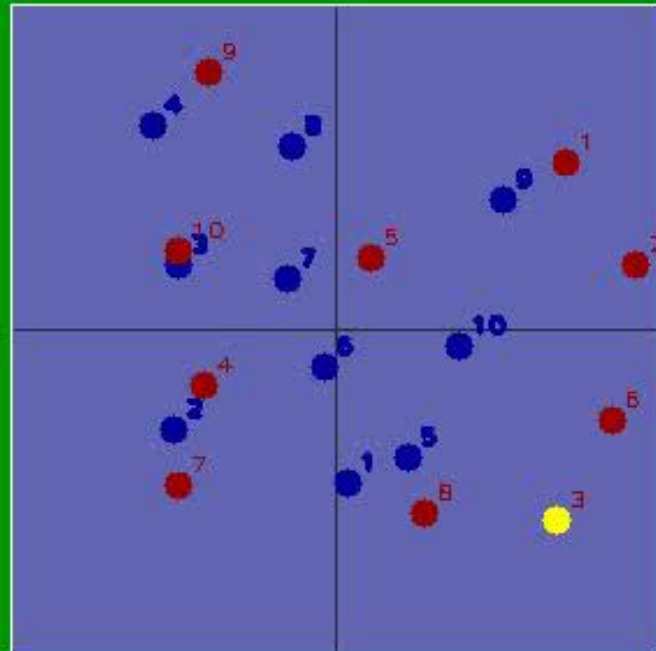
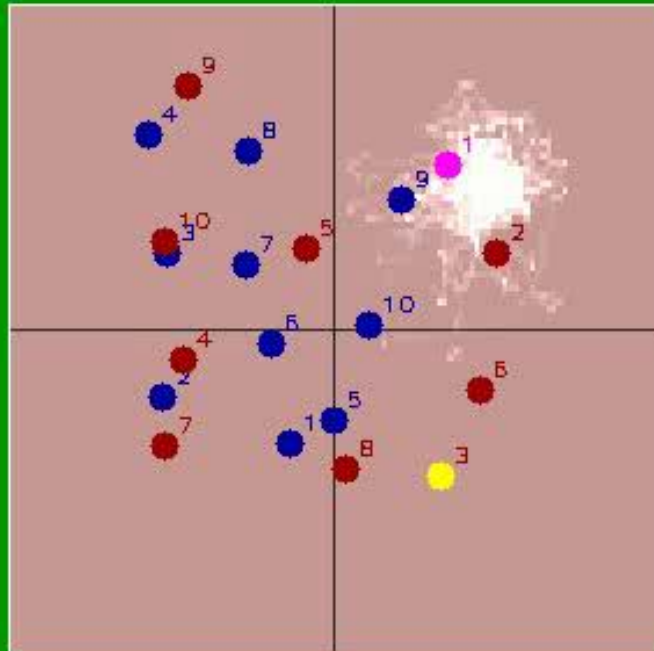
Translation and renormalization

TRACKING DATA ANALYSIS

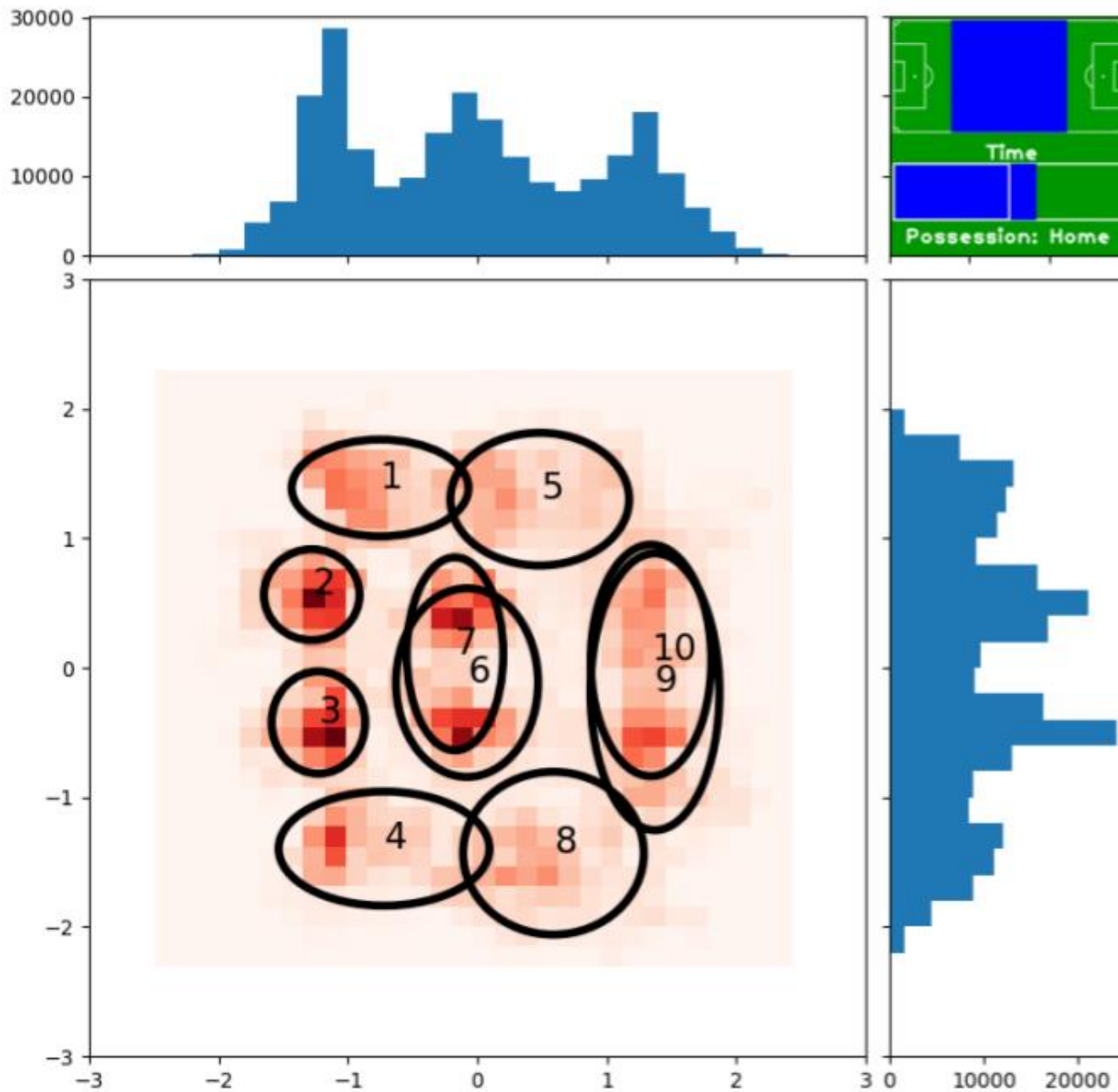


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TIME: 00:12 (314)
SECONDS: 12.56
FRAME: 314
POSSESSION:
Away
SCORE:
H: 0 A: 0
EV: PASS
S_EV:

Histogram of individual
player's positions



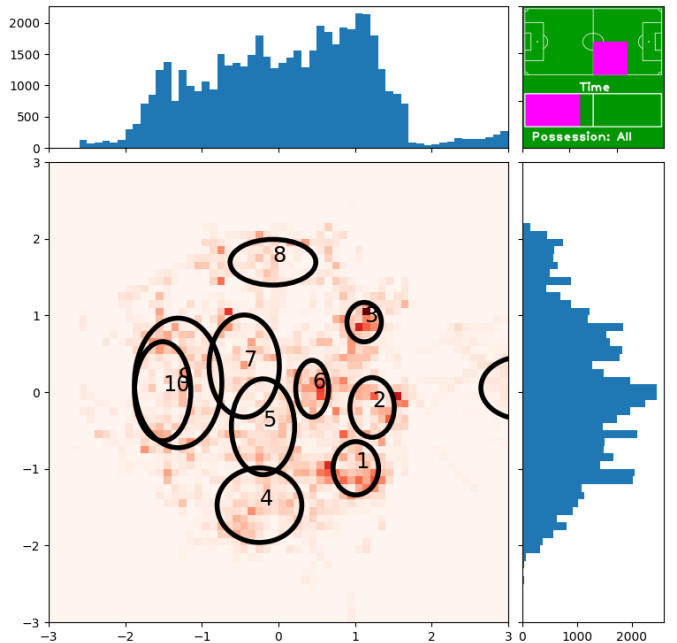
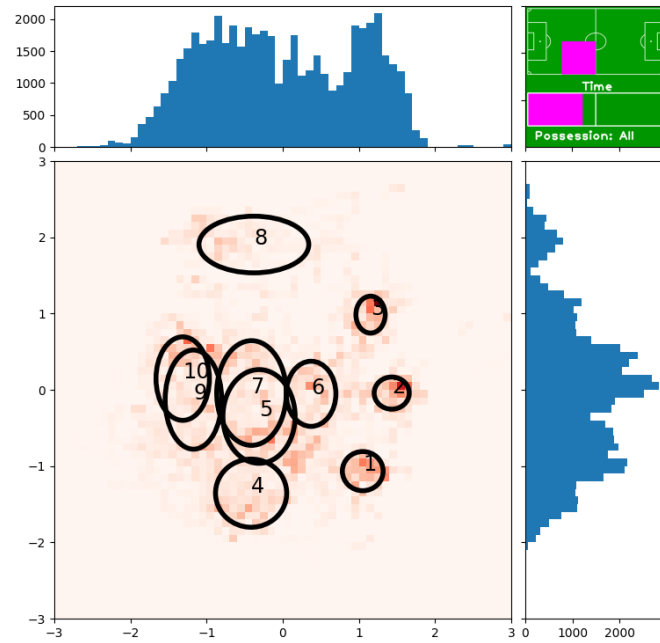
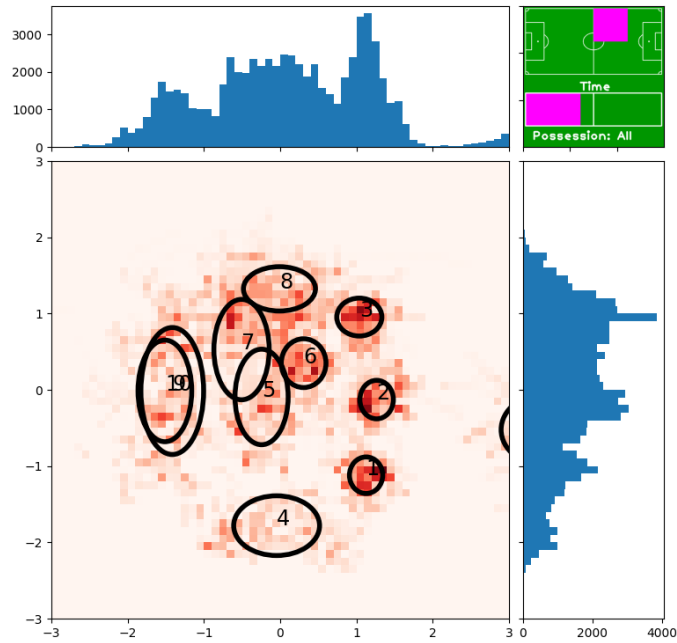
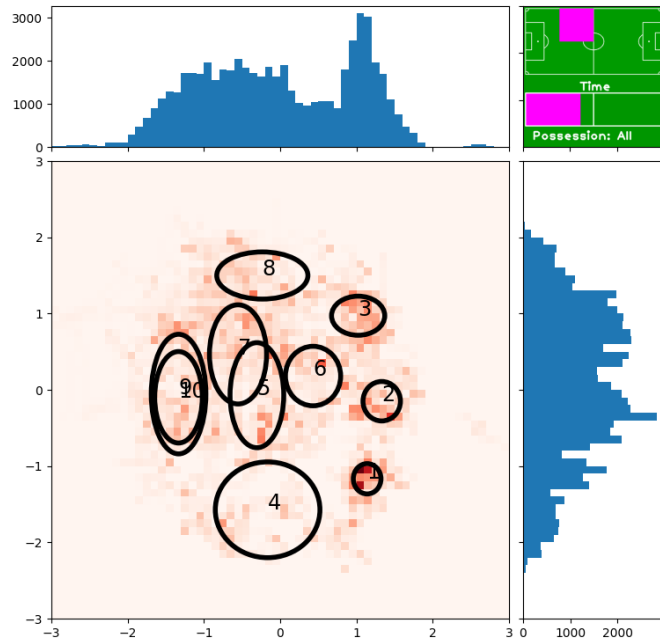
TRACKING DATA ANALYSIS



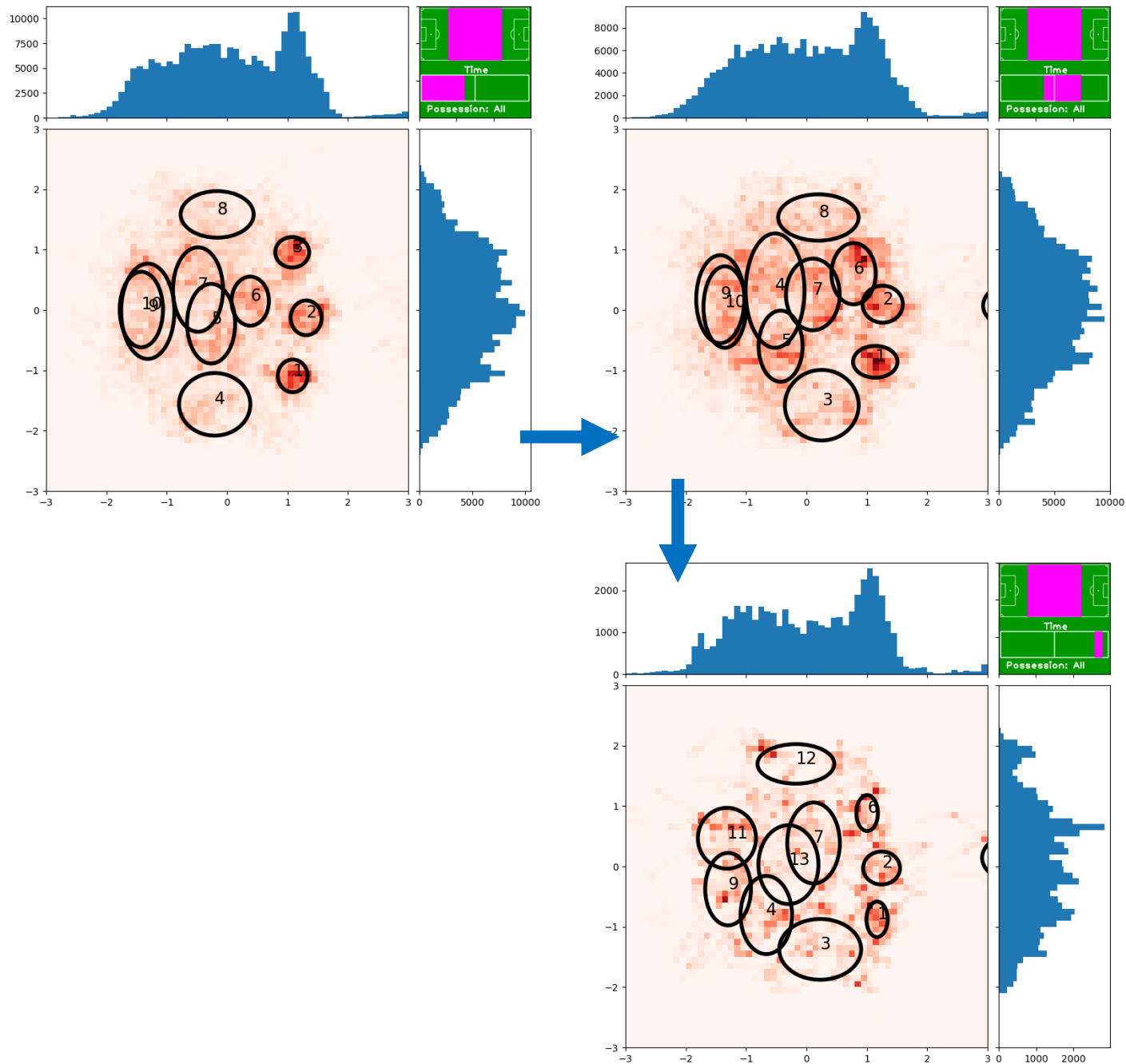
Histogram of individual
player's positions

TRACKING DATA ANALYSIS

Sector analysis



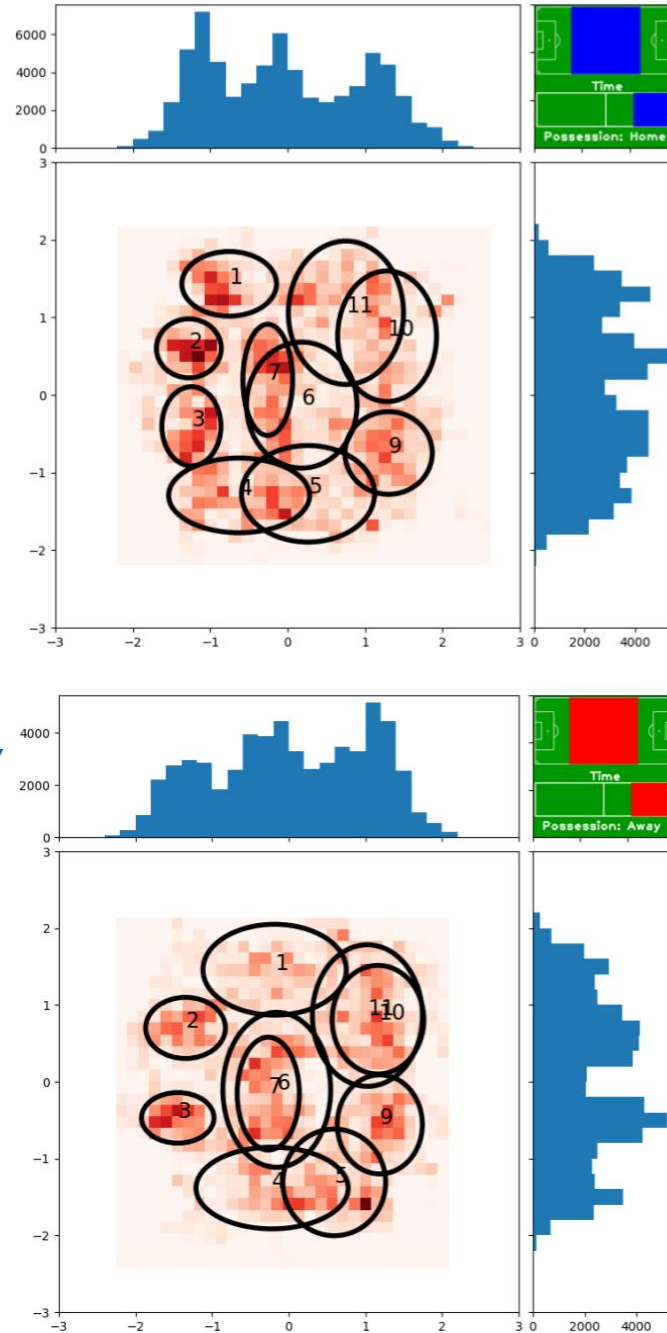
TRACKING DATA ANALYSIS



Time analysis

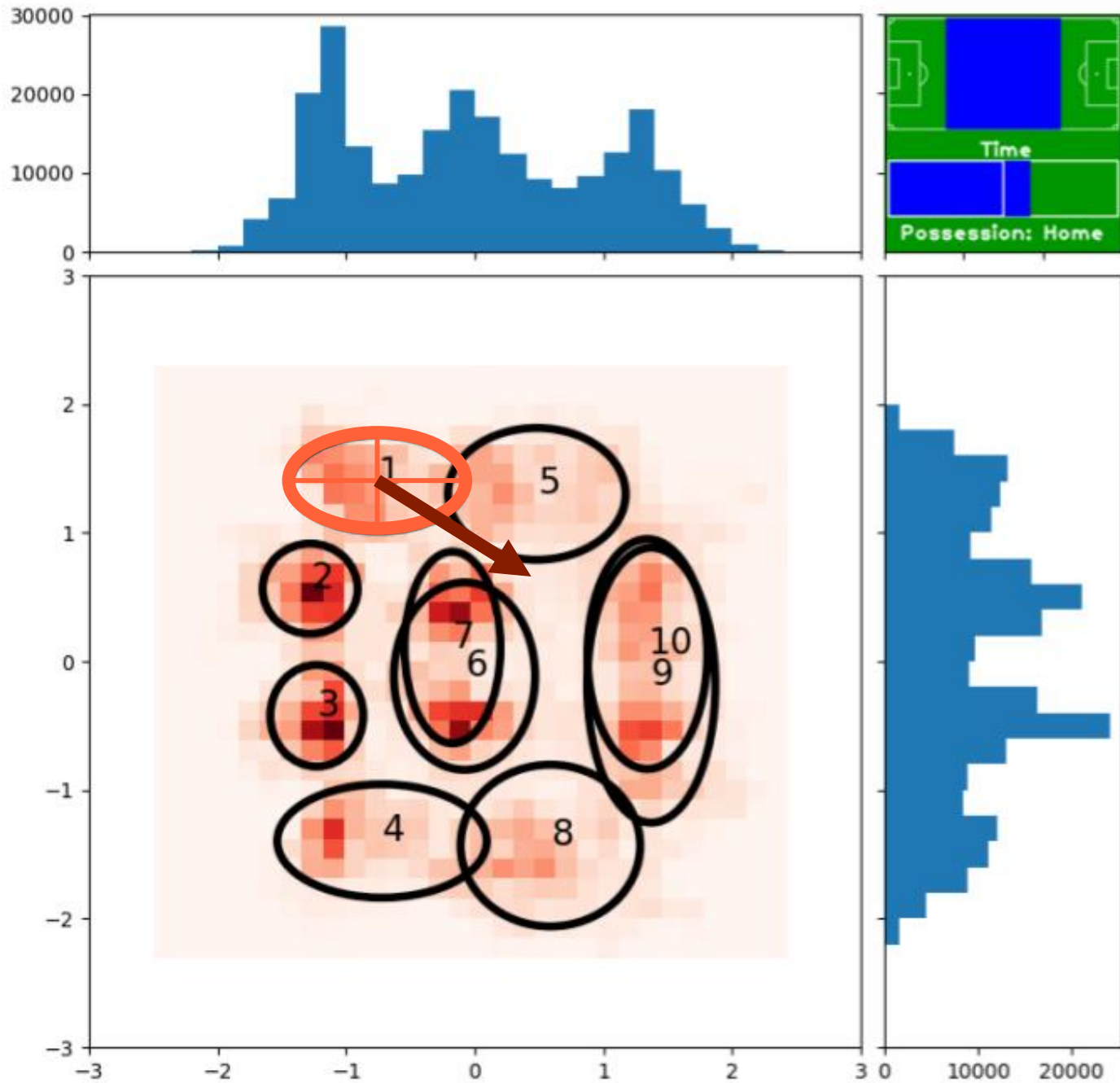
TRACKING DATA ANALYSIS

POSSESION
ON



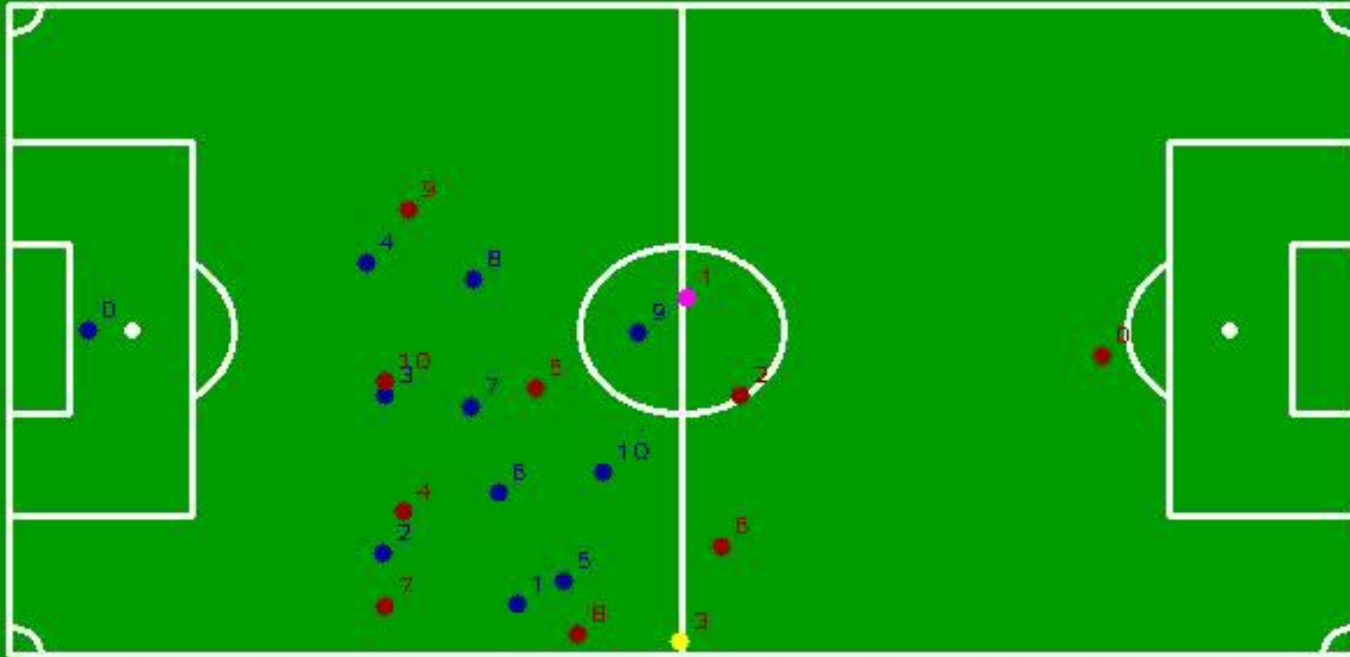
Evolution with
possession windows

TRACKING DATA ANALYSIS



Identification of
player's excursions

TRACKING DATA ANALYSIS



PERIOD: 1
TIME: 00:12 (314)
SECONDS: 12.56
FRAME: 314
POSSESSION:
Away
SCORE:
H: 0 A: 0
EV: PASS
S_EV:

Identification of
player's excursions

