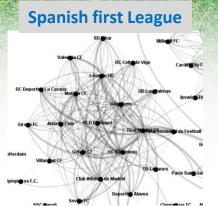
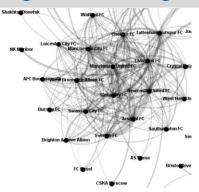
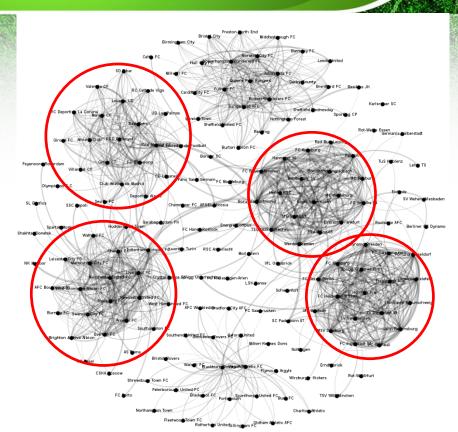


Graphic Presentation

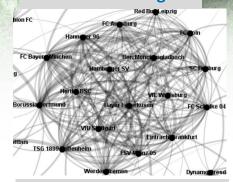


England Premier League

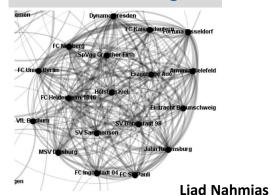




German first League



German second League



Network Traits

Network Attributes

vertices = 169
directed = TRUE
hyper = FALSE
loops = FALSE
multiple = FALSE
bipartite = FALSE
title = GoalsGraph
total edges= 1413
missing edges= 0
non-missing edges= 1413

Density

0.04976754

Isolates

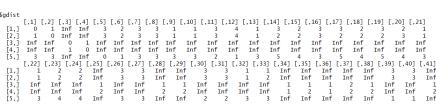
102 "Karlsruher SC"

Diameter

33

Geodesic

Distribution



Components



Karlsruher SC

First tier

England

Second tier

England

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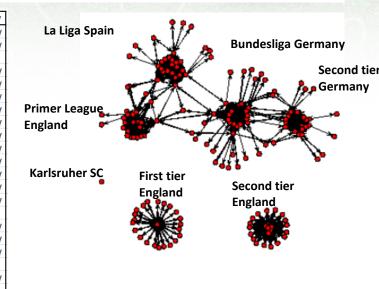
Network Cut-Points

Cut-Points

[1] 1 2 8 9 10 13 17 18 19 21 22 23 24 33 44 51 53 54 57 68 74 85 88 101

- The Cut Points are between the two leagues of Germany, Spain and England
- Cross Countries The cut points are between teams who participated the Champions League

ID	Team Name	Country
1	Hannover 96	Germany
2	Bor. Monchengladbach	Germany
8	Manchester United FC	England
9	TSG 1899 Hoffenheim	Germany
10	FC Bayern Minchen	Germany
13	FC Schalke 04	Germany
17	SpVgg Greuther Firth	Germany
18	FC Union Berlin	Germany
19	FC Heidenheim 1846	Germany
21	VfB Stuttgart	Germany
22	Hertha BSC	Germany
23	Dynamo Dresden	Germany
24	FC Kaiserslautern	Germany
33	SC Freiburg	Germany
44	FC Barcelona	Spain
51	FC Ingolstadt 04	Germany
53	Eintracht Frankfurt	Germany
54	VfL Bochum	Germany
57	Manchester City FC	England
68	FC Koln	Germany
74	Liverpool FC	England
85	Werder Bremen	Germany
88	Borussia Dortmund	Germany
101	FSV Mainz 05	Germany



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Network Centrality

Closeness

[1]	0	0	0	0	0 (0 0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0	0	0	0	0	0 (0 (0 0	0 (0	0	0	0	0	0	0	0	0	0	0 (0 (0	0	0	0	0	0	0	0	0	0 (0 (0 0	0	0	0	0
[63]	0	0	0	0	0 (0 0	0	0	0	0	0	0	0 (0	0 (0	0	0	0	0	0	0	0	0	0	0 (0 (0 (0 (0	0	0	0	0	0	0	0	0	0 (0 (0 (0	0	0	0	0	0	0	0	0	0 (0 (0 0	0 (0	0	0
T125	1 0	0	Λ	Λ	0	n n	0	Λ	Λ	Λ	Λ.	Λ.	0 (1 (n n	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ.	0 (n r	۱ (۱ n	0	Λ	Λ	Λ	Λ	Λ	Λ	Λ	Λ (Λ.	n (۱ ۸																

Betweenness

		CVVCCII									
	[1]	255.2832579	473.3369053	54.8713235	0.2477124	17.0925428	2754.8066676	39.6510241	555.6766630	1926.0327912	
[[10]	1012.7374817	39.4688679	48.3343799	320.7244252	7.8534004	456.4917928	12.1693388	112.0970817	1011.2728730	
[[19]	112.0028929	237.0476410	934.8183667	138.1887832	909.7322074	656.5740304	0.3102124	827.9146577	15.2594273	
[[28]	0.1055556	37.6477124	42.0566826	17.8763090	141.0834190	1153.5044829	45.4977124	0.2268791	35.0680556	
[[37]	0.1713235	0.1713235	80.1948467	49.1340769	44.6379902	0.1643791	7.1094974	580.2503096	0.3102124	
[[46]	386.5363049	63.2347222	191.5205947	6.7638714	46.8942980	273.9264868	15.1357737	216.7420888	267.9317250	
[[55]	28.6457784	0.1055556	668.3558552	6.5710965	23.9470320	33.1622033	32.0895167	289.5000000	0.0000000	
[[64]	10.2000711	0.3102124	109.1109678	44.0925937	121.8704311	35.7783850	11.0910229	317.9627203	0.0000000	
[[73]	7.3587815	2091.4899041	31.1966845	0.0000000	146.5000000	0.2268791	69.3264783	110.8250410	4.3209609	
[[82]	148.8706028	28.9928756	9.7998456	126.4195720	0.0000000	7.2578227	4179.2861399	0.2268791	0.0000000	
	[91]	4.3979444	179.8437354	27.4663416	0.0000000	242.6355923	0.0000000	0.0000000	2156.5654536	80.5540518	
[1	L00]	0.0000000	754.3588315	0.0000000	1087.9309830	0.0000000	16.8633864	31.4736076	29.4879902	0.0000000	
[1	L09]	0.1643791	0.0000000	0.0000000	0.0000000	25.9100563	1.8241919	0.0000000	0.0000000	0.2513889	
[]	L18]	0.0000000	8.1446739	0.0000000	0.0000000	0.3102124	0.0000000	0.0000000	0.0000000	0.2513889	
[]	L27]	17.6394523	0.0000000	0.0000000	1.5632925	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	
	L36]	12.3571429	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	
	L45]	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	
_	L54]	0.0000000	122.2206124	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	
Г1	1637	0 0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0 0000000			

Conclusions:

- The network isn't connected.
- 41 is the highest degree both goals it scored and were scored.
- The highest betweenness values – in the biggest component compare to the three other components

Degree

[1] 34 34 40 11 13 37 31 39 32 37 15 30 33 31 33 22 32 35 32 33 32 33 32 14 37 28 8 38 26 16 32 32 40 12 38 10 12 30 25 40 [42] 12 29 36 13 18 43 30 29 32 30 15 33 28 29 10 41 17 31 15 15 41 3 19 13 31 32 31 31 20 30 2 27 39 14 3 34 13 30 5 17 30 [83] 30 31 30 3 16 39 12 1 17 27 13 1 28 3 2 39 30 1 33 0 33 1 3 16 36 2 12 9 3 2 13 17 3 2 13 1 16 2 2 14 4 [124] 4 2 13 4 4 4 3 3 4 2 1 4 3 4 4 2 2 2 2 2 3 3 1 3 2 1 3 3 1 3 1 1 4 2 1 2 1 3 2 4 2 3

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Two Measurements

Page Rank

The highest value the more teams scored goals to you

Hertha BSC

Chelsea FC

Levante UD

Sevilla FC

Arsenal FC

VfL Bochum

Watford FC

Hannover 96 Bor. Monchengladbach 0.010361331 0.009561713 CD Leganes Real Madrid CF 0.003496285 0.012846996 TSG 1899 Hoffenheim FC Bayern Minchen 0.010238935 0.008927817 FC Schalke 04 Arminia Bielefeld 0.006867124 0.009645000 SpVgg Greuther Firth FC Union Berlin 0.009306997 0.010450394 VfB Stuttgart 0.010647596 0.008245291 Sheffield United FC 0.004509872 0.008622976 Aston Villa FC 0.012392887 0.012583494 SC Freiburg Bolton Wanderers FC 0.011091120 0.016591722 Sheffield Wednesday Leeds United 0.002775008 0.004106478 Fulham FC Brentford FC 0.012533784 0.003636185 Cardiff City FC 0.003800328 0.003982623 Jahn Regensburg 0.010180526 0.011211475 Eintracht Frankfurt 0.009443704 0.007310140 Manchester City FC AFC Bournemouth 0.010244779 0.004531258 Valencia CF Blackburn Rovers FC 0.004248084 0.037677065 Nottingham Forest RCD Espanyol 0.003839305 0.008749737 Erzaebirae Aue 0.009406112 0.005356952 MSV Duisburg Liverpool FC 0.009082354 0.010120910 Wigan Athletic FC Barnslev FC 0.022191398 0.004676702 Crystal Palace FC SV Sandhausen 0.005676835 0.007396868 Werder Bremen Fleetwood Town FC 0.007754196 0.003401991

Sunderland AFC 0.020271684 Stoke City FC 0.013453985 Girona FC 0.002848972 Holstein Kiel 0.005949574 FC Heidenheim 1846 0.011404850 Dynamo Dresden 0.012344964 Swansea City FC 0.010748384 RC Deportivo La Coruna 0.007533960 Reading 0.004112787 Getafe CF 0.008632242 Eintracht Braunschweig 0.007505095 Oueens Park Rangers 0.014539124 FC Ingolstadt 04 0.009465085 Red Bull Leipzia 0.004758585 0.011367651 Milton Keynes Dons 0.003111796 Newcastle United FC 0.010499082 Club Atletico de Madrid 0.005723075 SD Fibar 0.004390593 FC St. Pauli

0.009920274

0.013136799

0.005089897

Huddersfield Town

West Bromwich Albion FC

Millwall FC 0.003840295 Manchester United FC 0.009433950 Athletic Club 0.011218826 Leicester City FC 0.005655828 FC Nirnberg 0.009169778 FC Kaiserslautern 0.011038308 Birmingham City 0.003435368 FC Augsburg 0.009153721 Norwich City FC 0.013082717 Malaga CF 0.012228375 FC Barcelona 0.005581008 Fortuna Disseldorf 0.008890949 Villarreal CF 0.003534839 Middlesbrough FC 0.003577676 Everton FC Real Sociedad de Football 0.005761075 Burnlev FC 0.003244999 FC Koln 0.012144575 TSV 1860 Mincher 0.001454987 Bristol Rovers 0.002802589 SC Paderborn 07 0.001896163 SV Darmstadt 98 0.010856181 Borussia Dortmund 0.011552475

Eccentricity

Maximum of the shortest paths to all other nodes

Hannover 96	Bor. Monchengladbach	Sunderland AFC	Millwall FC
CD Leganes	Real Madrid CF	Stoke City FC	Manchester United FC
TSG 1899 Hoffenheim	FC Bayern Minchen	Girona FC	Athletic Club
FC Schalke 04	Arminia Bielefeld	Holstein Kiel	Leicester City FC
SpVgg Greuther Firth	FC Union Berlin	FC Heidenheim 1846	FC Nirnberg
VfB Stuttgart	Hertha BSC	Dynamo Dresden	FC Kaiserslautern
Sheffield United FC	Chelsea FC	Swansea City FC	Birmingham City
Aston Villa FC	Levante UD	RC Deportivo La Coruna	FC Augsburg
SC Freiburg	Bolton Wanderers FC	Reading 2	Norwich City FC
Leeds United	Sheffield Wednesday	Getafe CF	Malaga CF
Fulham FC	Brentford FC	Eintracht Braunschweig	FC Barcelona
Cardiff City FC	Sevilla FC	Queens Park Rangers 1	Fortuna Disseldorf
Jahn Regensburg 6	Arsenal FC	FC Ingolstadt 04	Villarreal CF 6
Eintracht Frankfurt 4	VfL Bochum	Red Bull Leipzig	Middlesbrough FC
Manchester City FC	AFC Bournemouth	Everton FC	Real Sociedad de Football
Valencia CF 6	Blackburn Rovers FC	Milton Keynes Dons	Burnley FC 6
Nottingham Forest 2	RCD Espanyol 6	Newcastle United FC 6	FC Koln 4
Erzgebirge Aue 6	Watford FC 6	Club Atletico de Madrid 7	TSV 1860 Minchen
MSV Duisburg 6	Liverpool FC 5	SD Eibar 6	Bristol Rovers
Wigan Athletic FC	Barnsley FC 2	FC St. Pauli 6	SC Paderborn 07
Crystal Palace FC 6	SV Sandhausen 6	West Bromwich Albion FC 6	SV Darmstadt 98

Random Network?

Random

- Closeness 0.3824257
- Betweeness 273,1006
- Degree 16.72189
- Stress 1132,166

The real Network

- Closeness 0
- Betweeness 178,2899
- Degree 16.72189
- Stress 1080.822

Yes

One Sample t-test

Closeness

```
data: sna::closeness(randNet)[, 1]
t = 1, df = 168, p-value = 0.3187
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
-0.002333544 0.007124305
sample estimates:
 mean of x
0.00239538
     One Sample t-test
```

Stress

```
data: sna::stresscent(randNet)[. 1]
t = 1.5446, df = 168, p-value = 0.1243
alternative hypothesis: true mean is not equal to 1076
95 percent confidence interval:
 1057.985 1223.577
sample estimates:
mean of x
 1140.781
```

No

One Sample t-test

Betweeness

```
data: sna::betweenness(randNet)[, 1]
t = 2.0162, df = 168, p-value = 0.04537
alternative hypothesis: true mean is not equal to 255.2833
95 percent confidence interval:
255.7111 295.8984
sample estimates:
mean of x
275.8047
```

One Sample t-test

Degree

```
data: sna::degree(randNet)[, 1]
t = -56.556, df = 168, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 34
95 percent confidence interval:
16.11877 17.32502
sample estimates:
mean of x
16.72189
```

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