



PROFESSIONAL &
CONTINUING EDUCATION
UNIVERSITY of WASHINGTON

I.

Theoretical:

Arrange Tables

II.

Practical

Change Over
Time

Week 6
Nov 17, 2015



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I have a table of data.

How do I arrange the data
in the table *spatially*?

Why does this decision matter so much?

Channels: Expressiveness Types and Effectiveness Ranks

➔ Magnitude Channels: Ordered Attributes

Position on common scale 

Position on unaligned scale 

Length (1D size) 

Tilt/angle 

Area (2D size) 

Depth (3D position) 

Color luminance 

Color saturation 

Curvature 

Volume (3D size) 

➔ Identity Channels: Categorical Attributes

Spatial region 

Color hue 

Motion 

Shape 

Most
Effectiveness
Least

How?

Encode

➔ Arrange

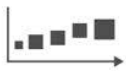
➔ Express



➔ Separate



➔ Order



➔ Align



➔ Use



➔ Map

from **categorical** and **ordered** attributes

➔ Color

➔ Hue



➔ Saturation



➔ Luminance



➔ Size, Angle, Curvature, ...



➔ Shape



➔ Motion

Direction, Rate, Frequency, ...



Manipulate

➔ Change



➔ Select



➔ Navigate

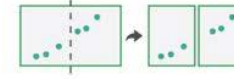


Facet

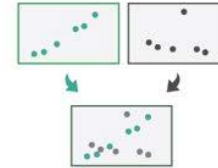
➔ Juxtapose



➔ Partition



➔ Superimpose



Reduce

➔ Filter



➔ Aggregate



➔ Embed



What?

Why?

How?

Arrange Tables

② Express Values

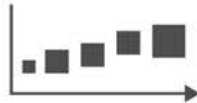


② Separate, Order, Align Regions

→ Separate



→ Order



→ Align



→ 1 Key
List



→ 2 Keys
Matrix



→ 3 Keys
Volume

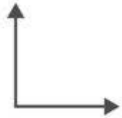


→ Many Keys
Recursive Subdivision

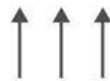


② Axis Orientation

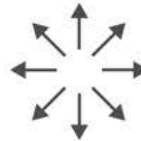
→ Rectilinear



→ Parallel

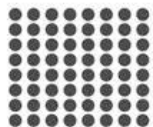


→ Radial



② Layout Density

→ Dense



→ Space-Filling



Translation

"Keys" → Discrete

"Values" → Continuous



Table 9

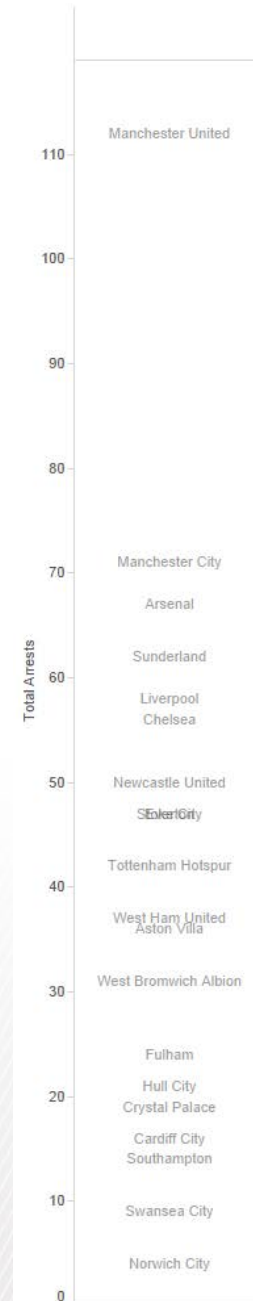
ARRESTS BY CLUB SUPPORTED & TYPE OF OFFENCE - PREMIER LEAGUE 2013-14 SEASON

	Premier League team supported (all competitions[1])	Total Arrests	Home Match Arrests	Arrests at Away matches	Other[2]	Type of Offence										
						Violent Disorder	Public Disorder	Missile Throwing	Racist or Indecent Chanting	Pitch Incursion	Alcohol Offences	Ticket Touting	Possession of Offensive Weapon	Use or Possession of Fireworks or Flares	Breach of Banning Order	Offences against Property
9	Arsenal	67	37	28	2	4	30	1	1	3	21	3	0	2	1	1
10	Aston Villa	36	16	20	0	3	16	0	2	1	8	0	0	6	0	0
11	Cardiff City	16	1	15	0	4	6	1	0	0	4	0	0	1	0	0
12	Chelsea	56	31	23	2	12	14	2	0	1	15	6	3	2	1	0
13	Crystal Palace	19	9	8	2	3	1	1	0	8	5	0	1	0	0	0
14	Everton	47	8	38	1	1	19	2	0	3	12	2	1	5	0	2
15	Fulham	24	9	15	0	1	7	1	0	1	5	5	0	2	0	2
16	Hull City	21	11	10	0	2	10	0	0	0	8	0	0	1	0	0
17	Liverpool	58	17	39	2	15	14	1	0	4	16	2	0	4	1	1
18	Manchester City	71	23	48	0	10	12	1	0	2	29	2	0	8	1	6
19	Manchester United	112	68	43	1	13	19	3	0	1	65	3	0	5	1	2
20	Newcastle United	50	27	23	0	7	6	1	1	8	23	2	0	1	0	1
21	Norwich City	4	2	2	0	0	1	0	0	0	3	0	0	0	0	0
22	Southampton	14	8	6	0	1	7	1	0	1	2	0	0	1	1	0
23	Stoke City	47	6	41	0	2	14	0	2	0	9	0	0	19	1	0
24	Sunderland	62	41	21	0	3	10	0	2	17	26	1	0	1	0	2
25	Swansea City	9	2	7	0	5	1	1	1	0	1	0	0	0	0	0
26	Tottenham Hotspur	42	25	16	1	9	21	4	0	0	6	1	0	1	0	0
27	West Bromwich Albion	31	18	12	1	7	16	0	0	1	5	0	0	1	1	0
28	West Ham United	37	11	26	0	9	13	0	0	1	13	0	0	0	0	1
29	Total	823	370	441	12	111	237	20	9	52	276	27	5	60	8	18

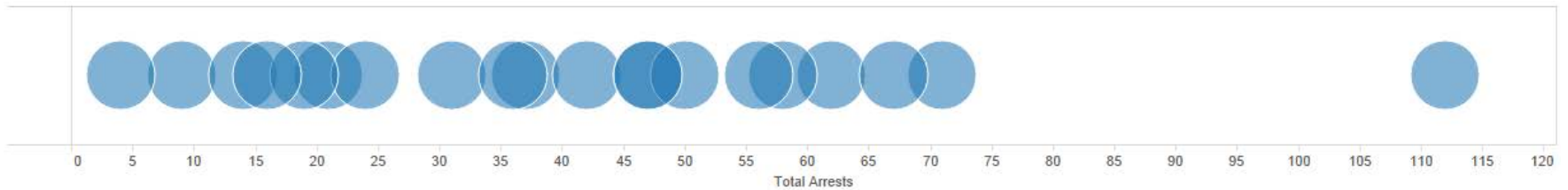
Note: The same key is used for tables 10, 11, 12 and 13

[\[1\] Includes arrests made by British Transport Police](#)[\[2\] Arrests not corresponding to a match involving the team followed by the arrested individual](#)

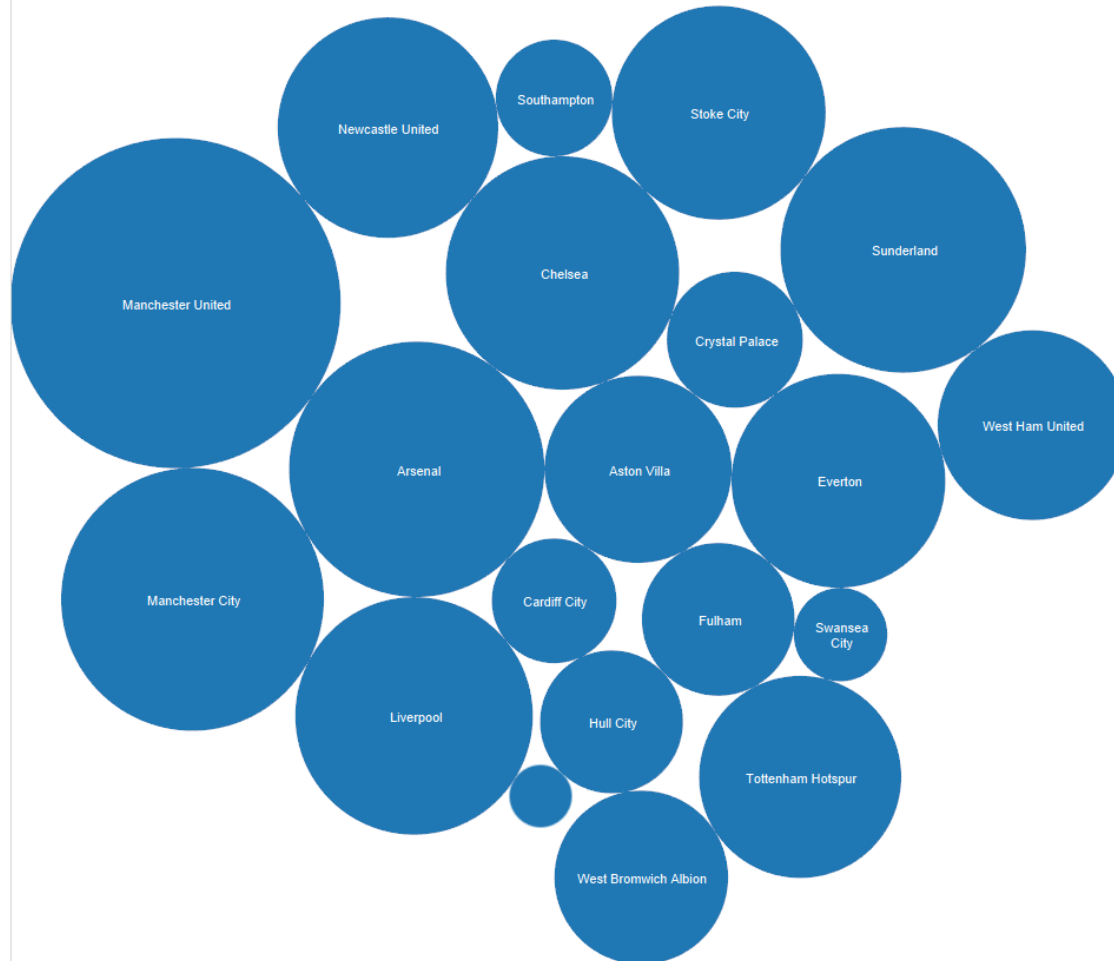
1 Key, 1 Value



1 Key, 1 Value

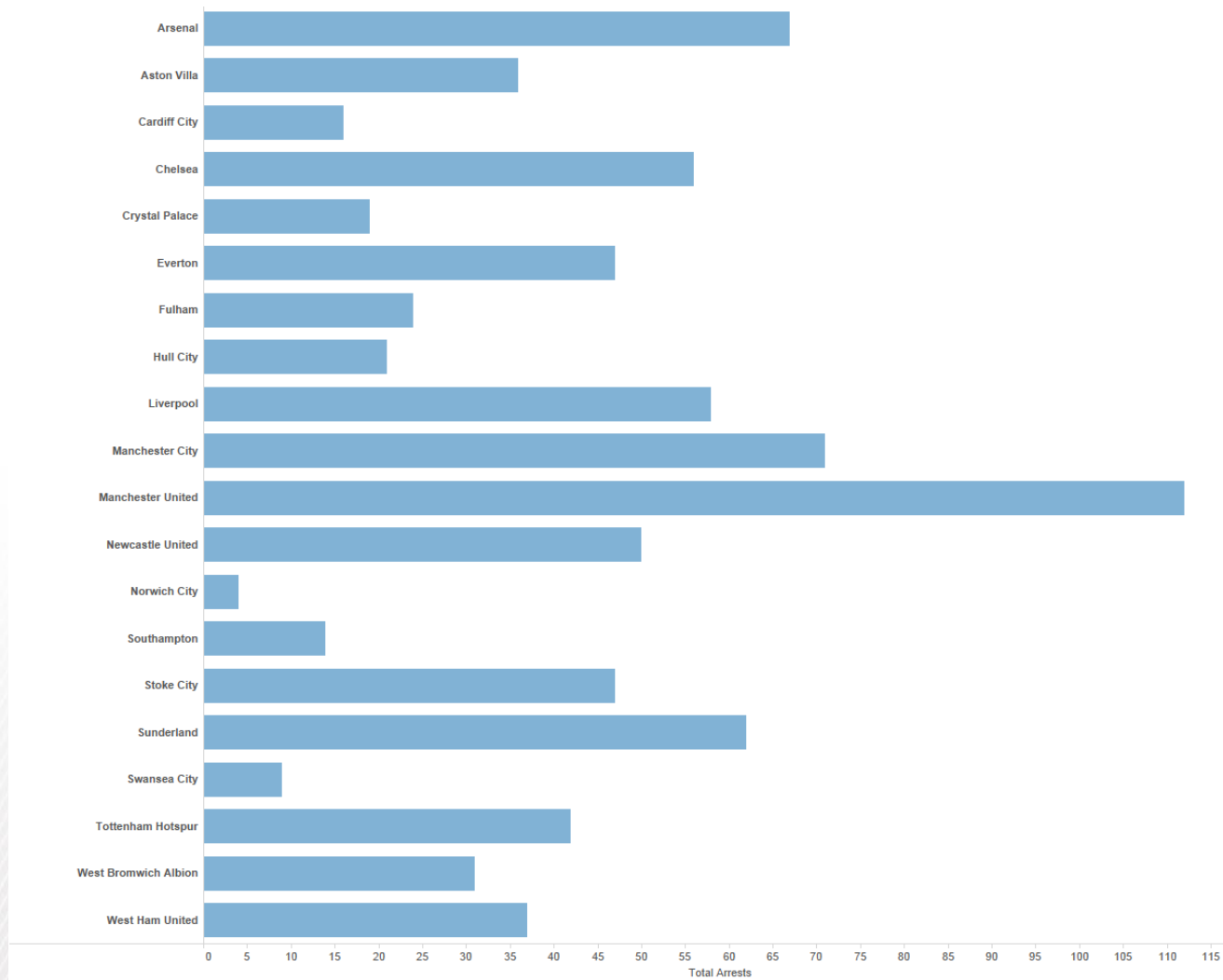


Separated but not Ordered or Aligned



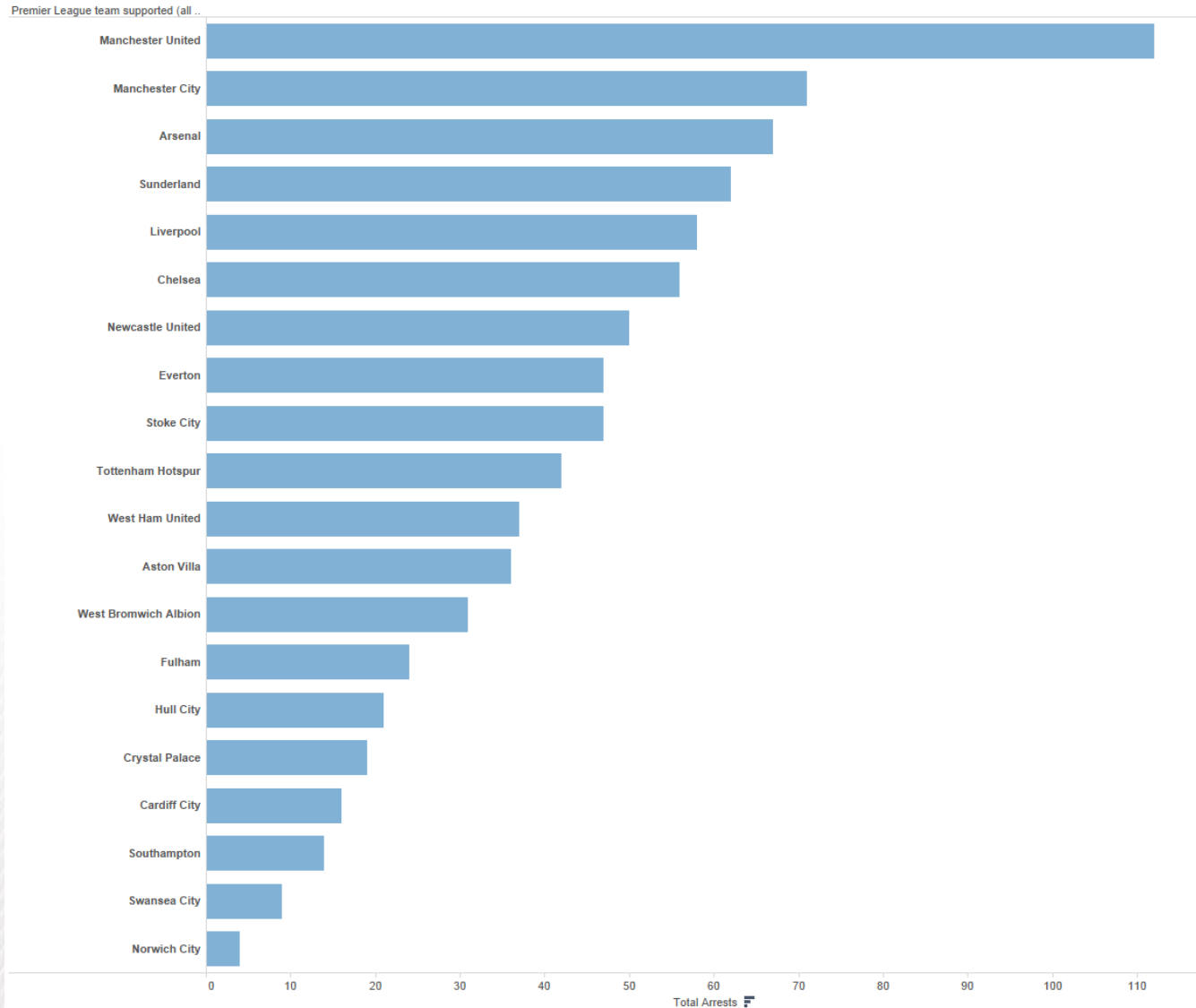
LIMITATION: Hard to make comparisons

Separated and Aligned but not Ordered

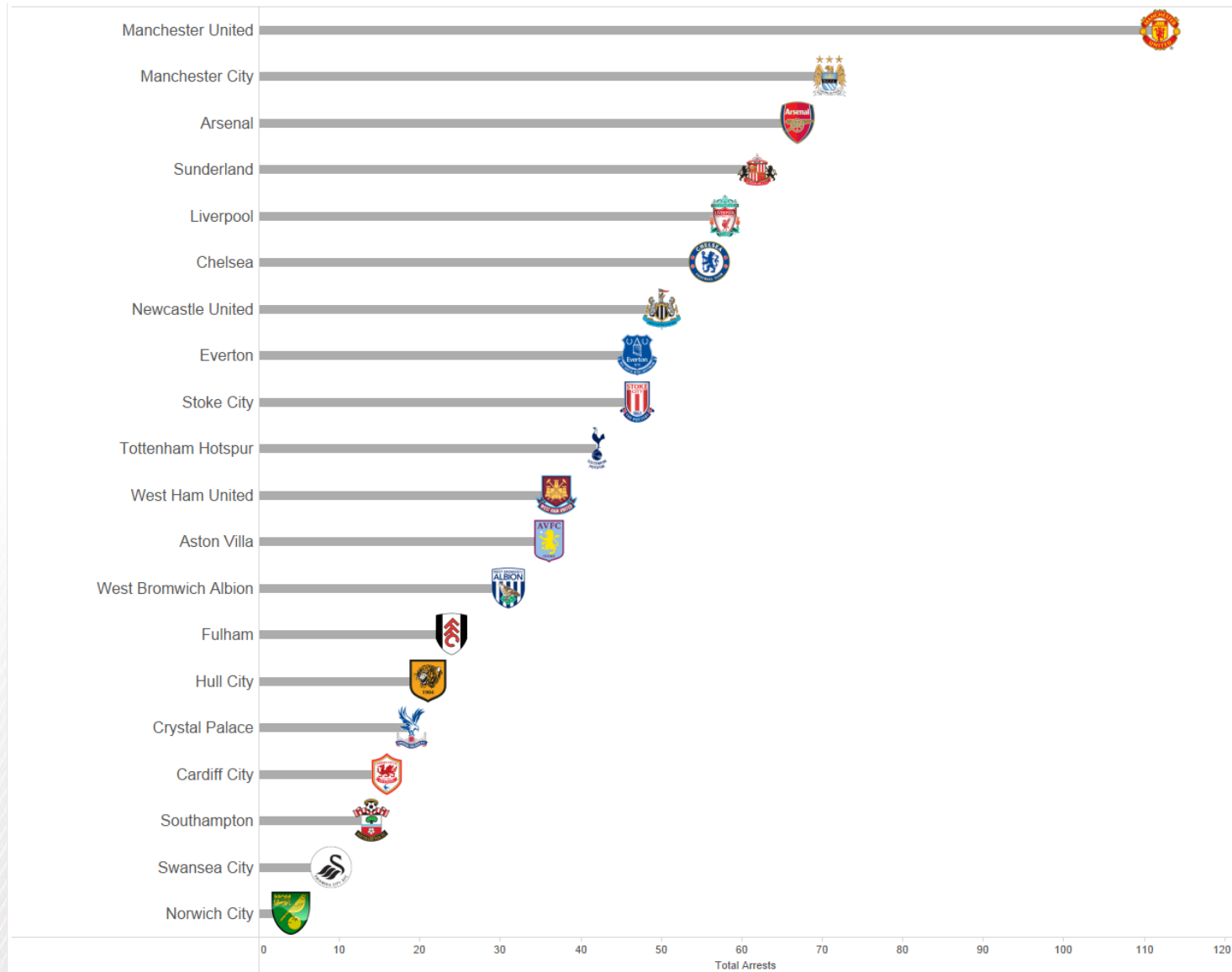


LIMITATION: Hard to know rank. What's the 4th most? The 7th?

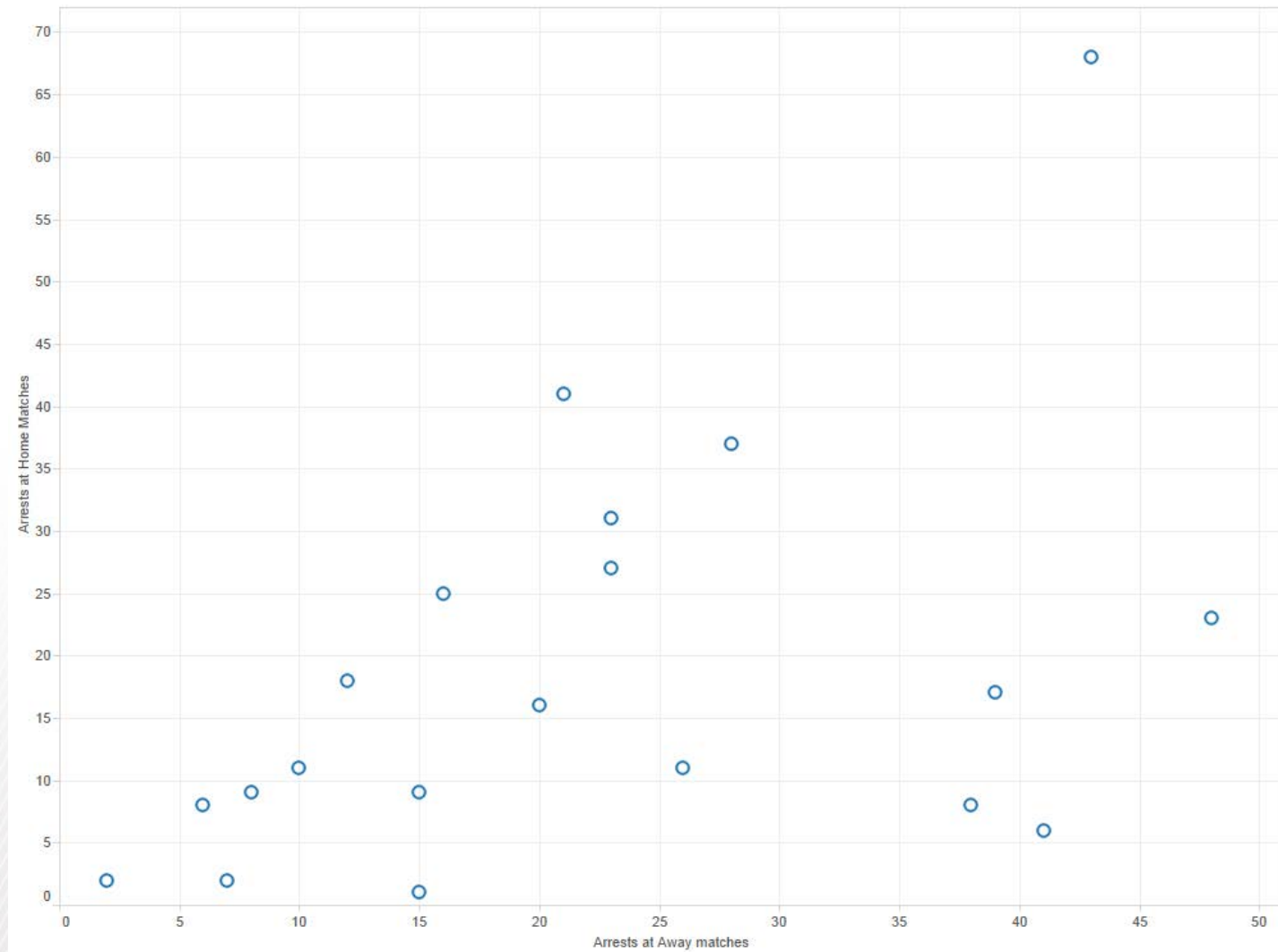
Separated, Aligned and Ordered



It doesn't have to just be "boring bar charts"

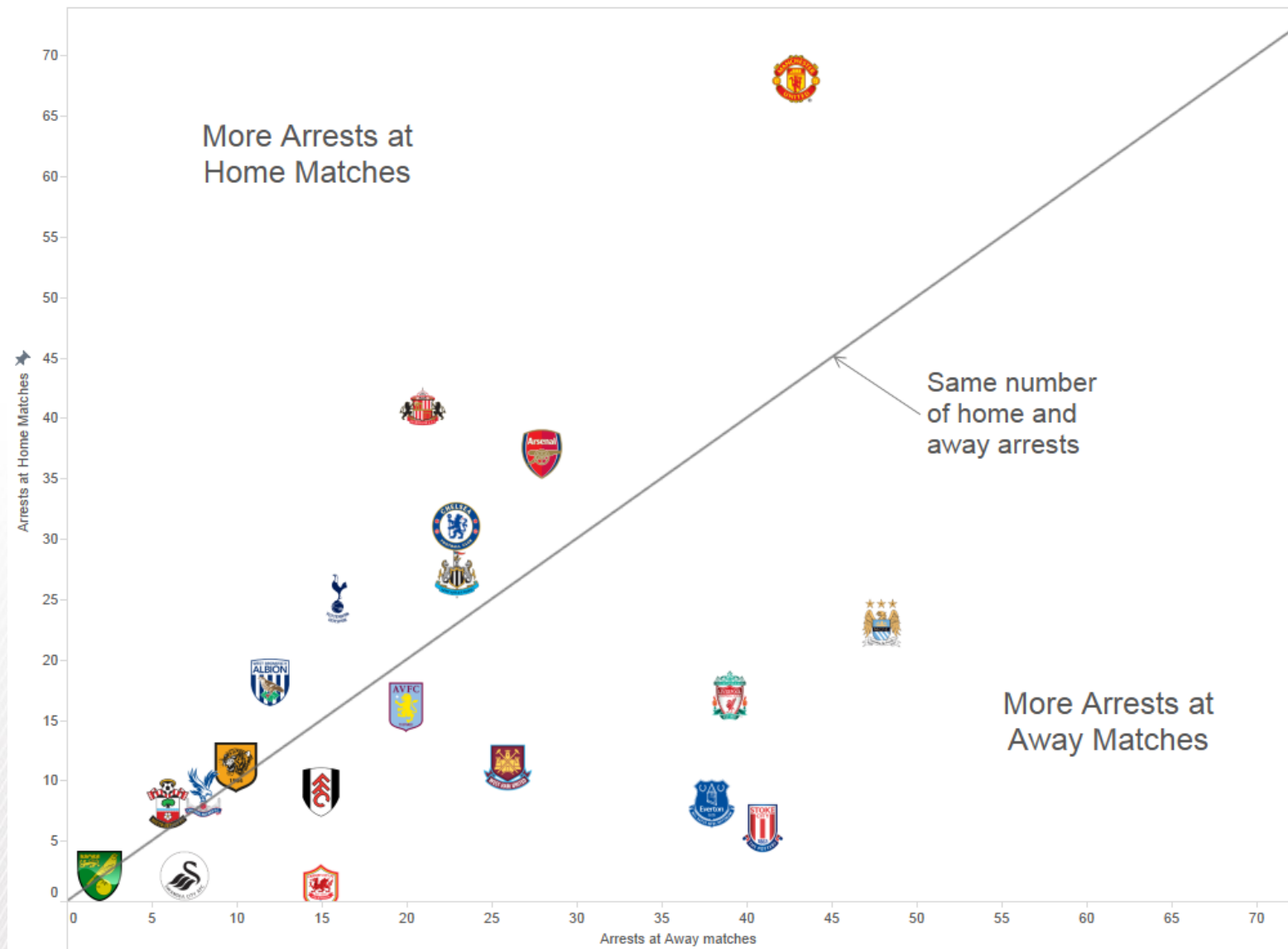


Scatterplots: 1 Key, 2 Values



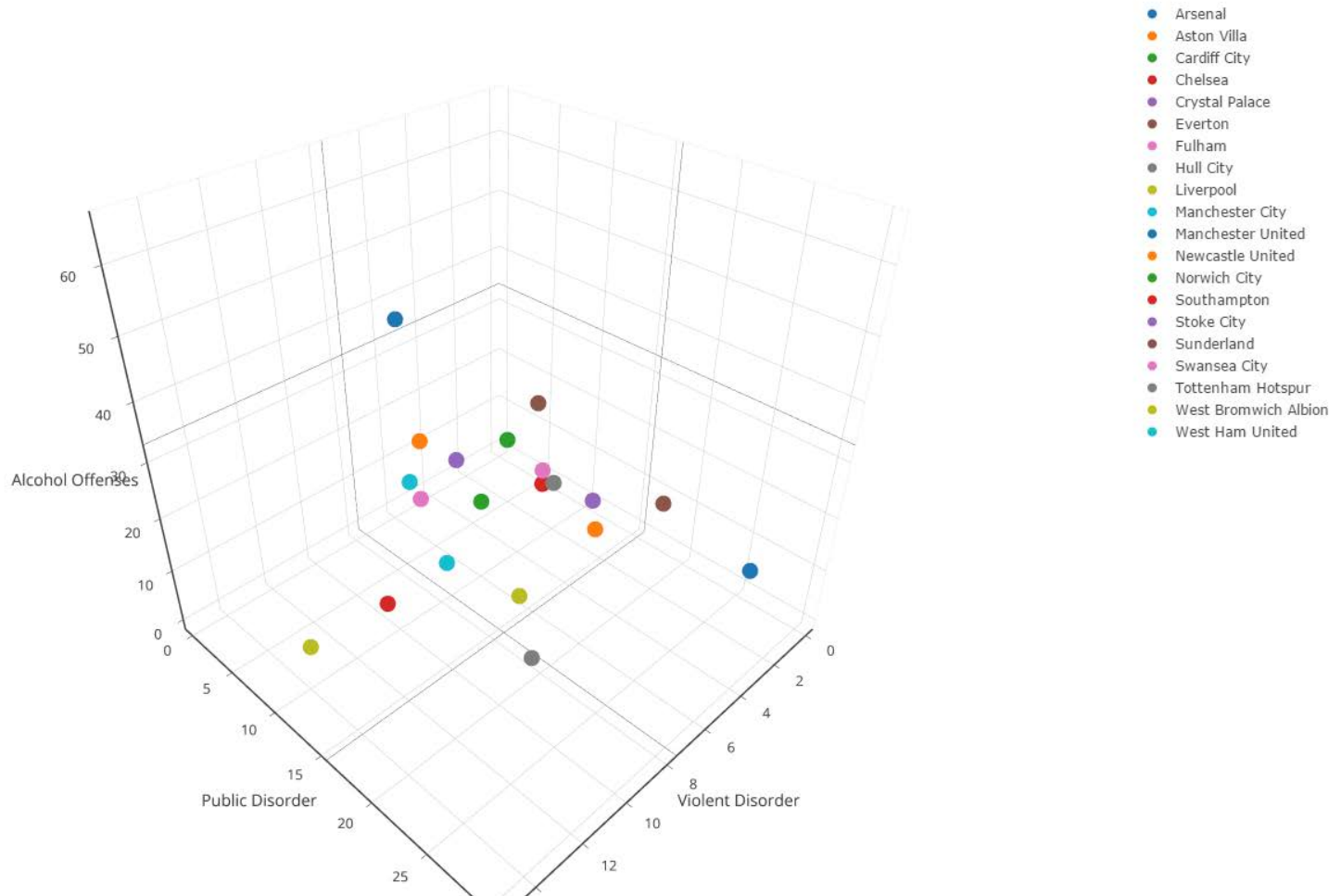
LIMITATION: Hard to read with > 100 dots

Scatterplots: 1 Key, 2 Values



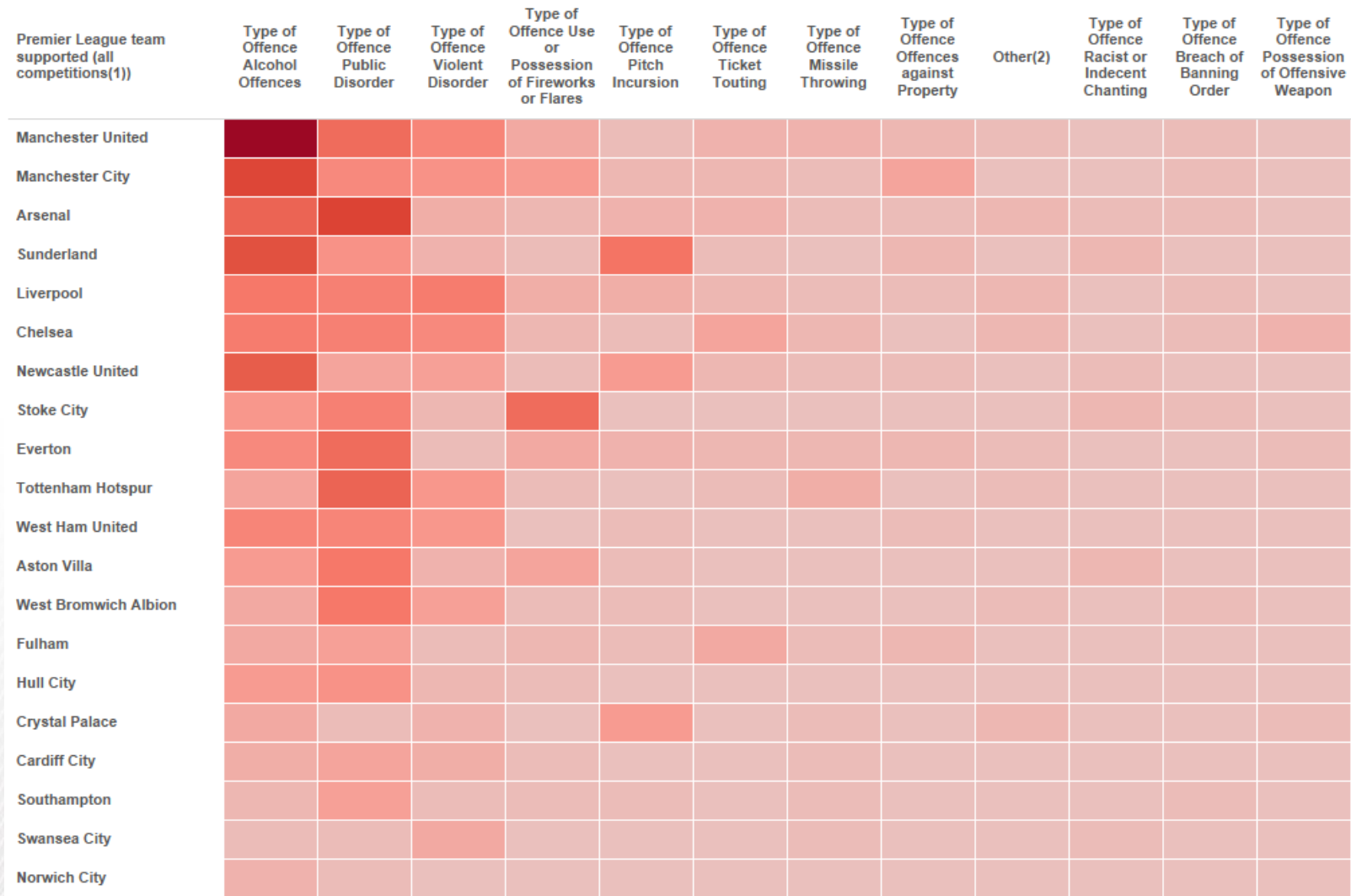
3D Scatterplots: 1 Key, 3 Values

Arrests by Type and Premier League Supporters



LIMITATION: Hard to gauge 3D position with 2D display

Cluster Heatmaps: 2 Keys, 1 Value



Good for overviews with high information density

2 Keys, 1 Value, but what is the 2nd Key?

← Key #1: Ideology →

Main Source of Government and Political News

% whose main source for news about gov't and politics is...

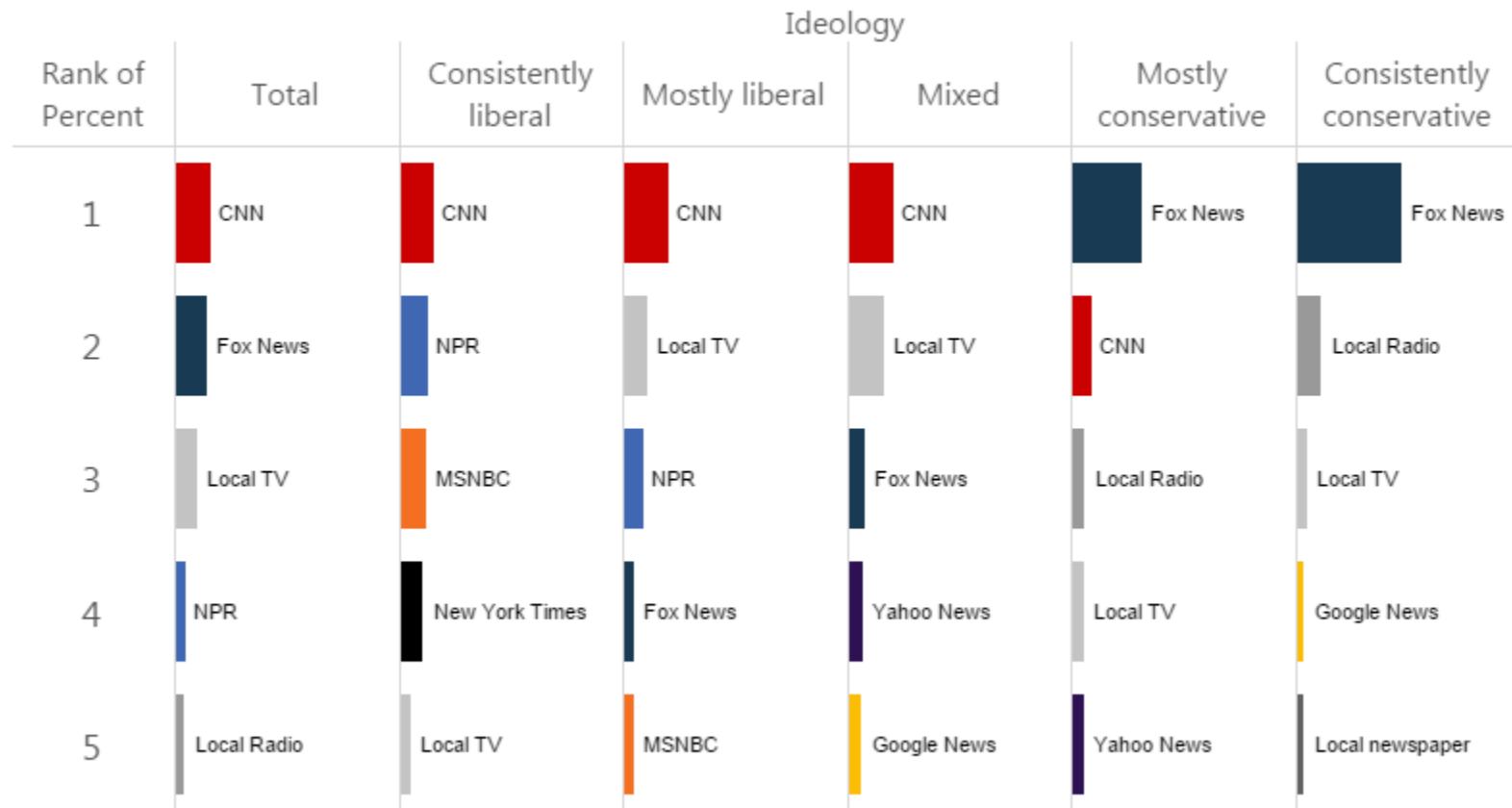
Total	Consistently liberal	Mostly liberal	Mixed	Mostly conservative	Consistently conservative
CNN 16%	CNN 15%	CNN 20%	CNN 20%	Fox News 31%	Fox News 47%
Fox News 14	NPR 13	Local TV 11	Local TV 16	CNN 9	Local radio 11
Local TV 10	MSNBC 12	NPR 9	Fox News 8	Local TV 6	Local TV 5
NPR 5	New York Times 10	Fox News 5	Yahoo News 7	Local radio 6	Local newspaper 3
Local radio 4	Local TV 5	MSNBC 5	Google News 6	Yahoo News 6	Google News 3

American Trends Panel (wave 1). Survey conducted March 19-April 29, 2014. Q19-Q19d. Based on web respondents. Ideological consistency based on a scale of 10 political values questions (see About the Survey for more details). Respondents were first asked what platform (TV, radio, etc.) they most use for news about government and politics, and then were asked to name the outlet they most turn to. Up to three answers were accepted.

PEW RESEARCH CENTER

The 2nd Key is Rank

Alternative #1. Simply Add Color: *Main Source of Gov't & Politics News*



Source: <http://www.journalism.org/2014/10/21/political-polarization-media-habits/#media-sources-nearly-half-of-consistent-conservatives-cite-fox-news>

Instead of just labeling news outlets, what if we colored them?

What if we change the 2nd Key to News Outlet?

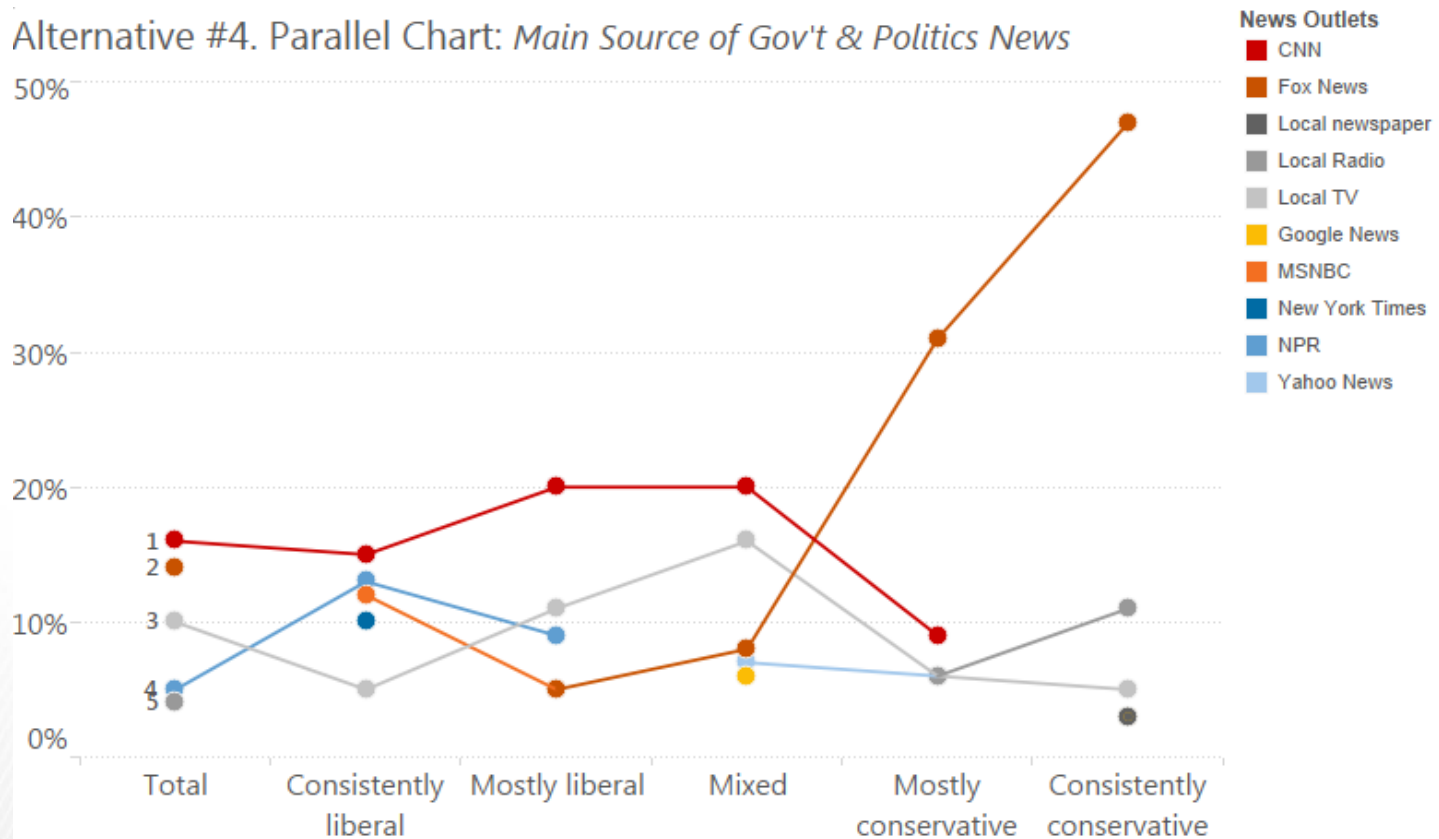
Alternative #3. HeatMap Table: *Main Source of Gov't & Politics News*

News Outlet Mostly Used	Ideology					
	Total	Consistently liberal	Mostly liberal	Mixed	Mostly conservative	Consistently conservative
CNN	16%	15%	20%	20%	9%	
Fox News	14%		5%	8%	31%	47%
Local TV	10%	5%	11%	16%	6%	5%
NPR	5%	13%	9%			
Local Radio	4%				6%	11%
MSNBC		12%	5%			
Yahoo News				7%	6%	
New York Times		10%				
Google News				6%		3%
Local newspaper						3%

Source: <http://www.journalism.org/2014/10/21/political-polarization-media-habits/#media-sources-nearly-half-of-consistent-conservatives-cite-fox-news>

Parallel Orientation: Parallel Layout

Alternative #4. Parallel Chart: *Main Source of Gov't & Politics News*



Source: <http://www.journalism.org/2014/10/21/political-polarization-media-habits/#media-sources-nearly-half-of-consistent-conservatives-cite-fox-news>



Ramon Martinez @HlthAnalysis · Nov 7

@DataRemixed @pewresearch what do you think about a 4th alternative: sort of Parallel Chart

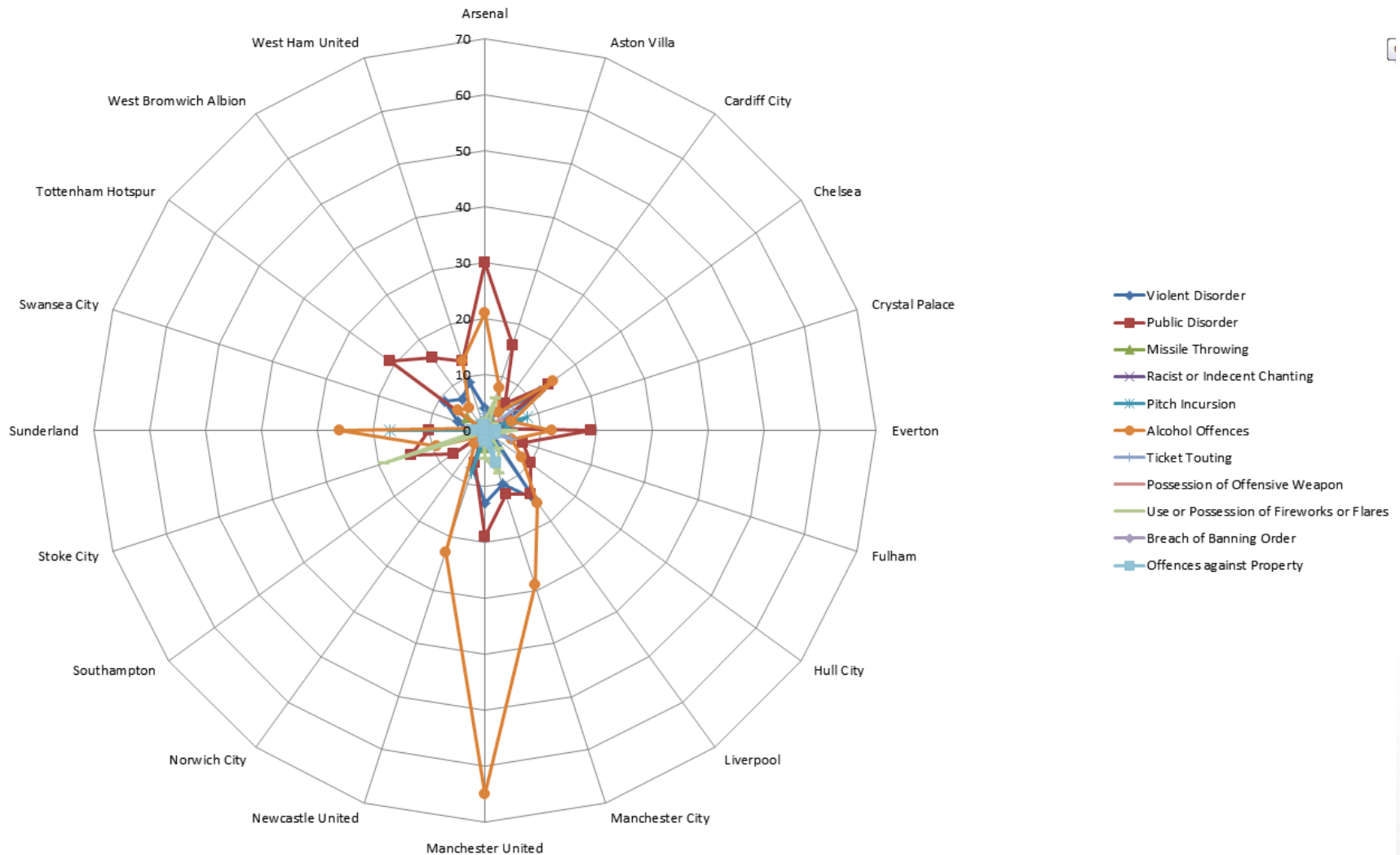


2



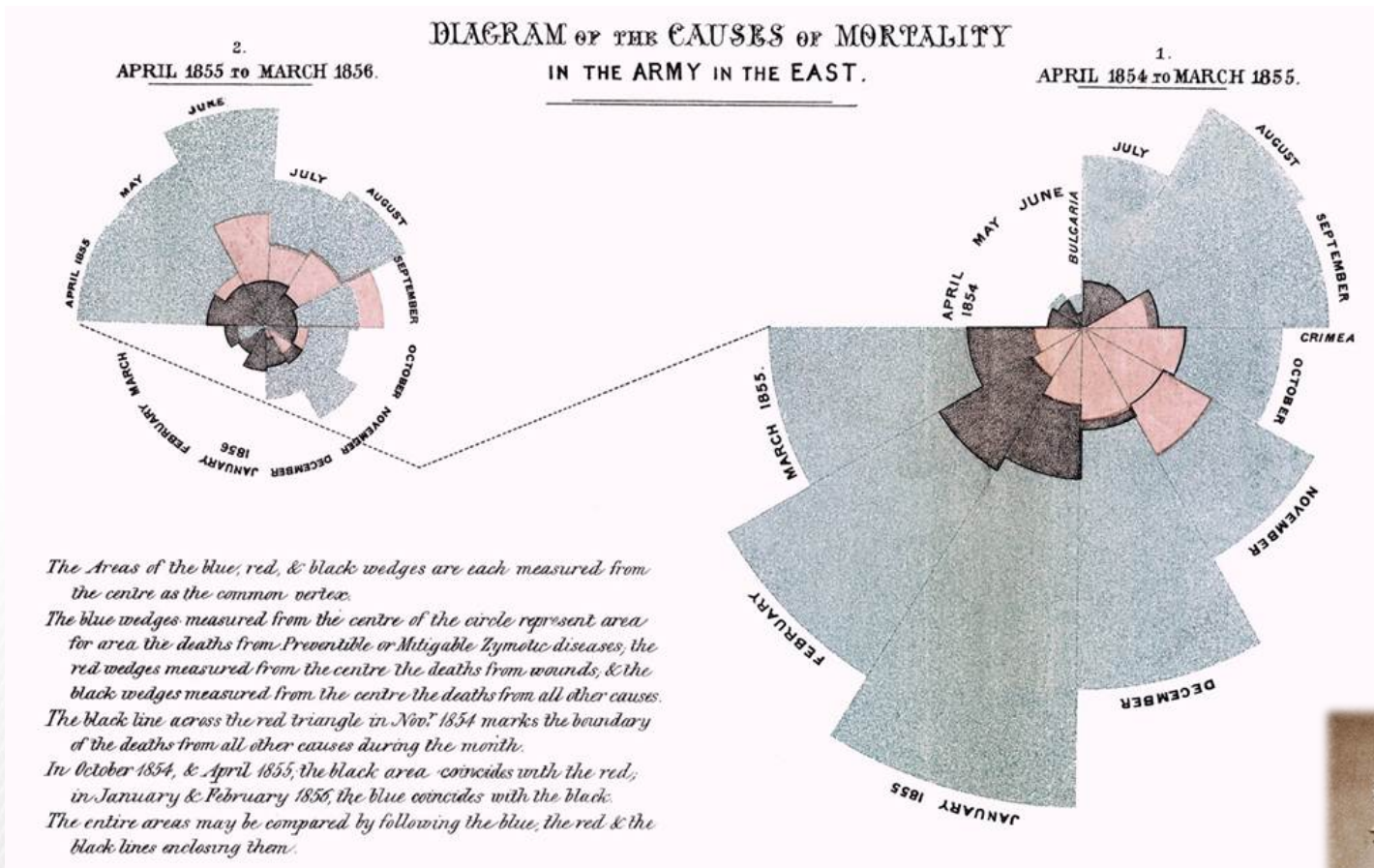
LIMITATION: How to determine order of the axes? Training time

Radial Orientation: Radar Plots



LIMITATION: Not good when categories aren't cyclic

"Diagram of the causes of mortality in the army in the East" (1858)



"Radar graphs: Avoid them (99.9% of the time)"



Os sinais da bússola eleitoral

Disputa de 2010 foi parecida com a de 2006

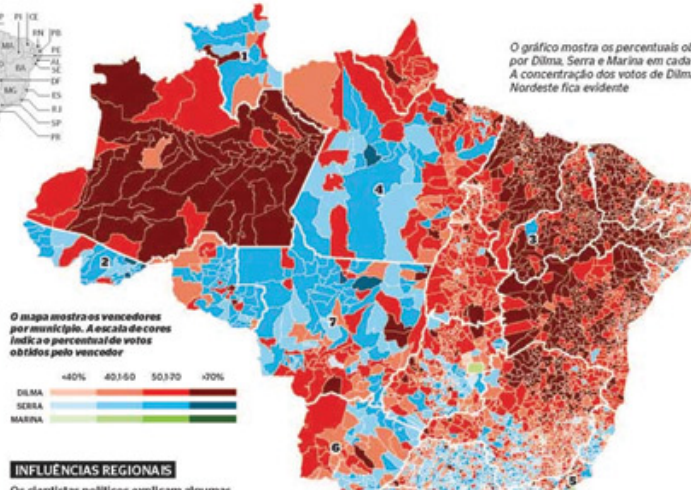
Alberto Cabro, Alexandre Massur, Carlos Eduardo Cruz Garcia, Eliseu Barreira Junior, Marco Vergotti e Ricardo Mendonça

O PRIMEIRO TURNO da eleição presidencial de 2010 foi muito parecido com o da disputa de 2006. A petista Dilma Rousseff teve apenas 1,7 ponto percentual a menos que o índice obtido pelo presidente Lula quatro anos atrás. A concentração maior de seus votos também foi no Nordeste. Dessa vez, porém, a disputa foi um pouco menos polarizada. Os votos que provocaram segundo turno foram divididos entre o tucano José Serra e a verde Marina Silva.

Eleitores: 135.804.433, abstenção: 24.610.296 (18,12%), votos válidos: 101.190.137 (91,86%), votos brancos: 3.479.340 (3,13%) e votos nulos: 6.124.254 (5,57%)

Candidatos	%	Votos
Dilma Rousseff (PT)	46,9%	(47.651.434)
José Serra (PSDB)	32,6%	(33.132.283)
Marina Silva (PV)	19,3%	(19.636.359)

Outros candidatos	%	Votos
Plínio (PSOC)	0,82%	(836.890)
José Maria Eymael (PSDC)	0,09%	(89.350)
Zé Maria (PSMA)	0,08%	(84.609)
Levy Fidelix (PPS)	0,06%	(57.960)
Ivan Pinheiro (PCB)	0,04%	(39.136)
Rui Costa Pimenta (POB)	0,01%	(12.206)



O mapa mostra os vencedores por município. A escala de cores indica o percentual de votos obtidos pelo vencedor

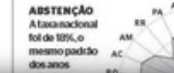
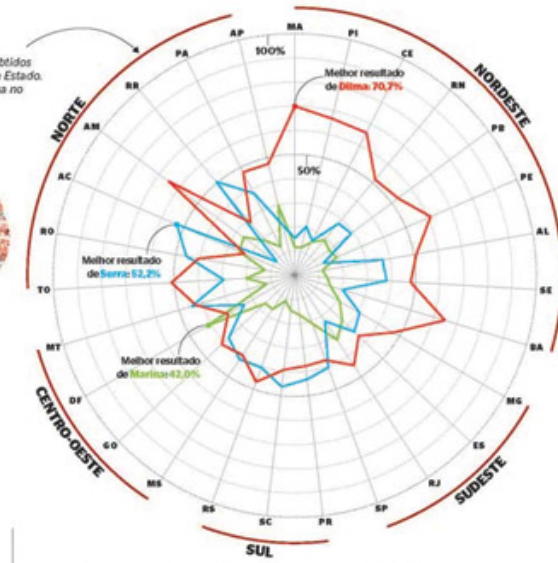


INFLUÊNCIAS REGIONAIS

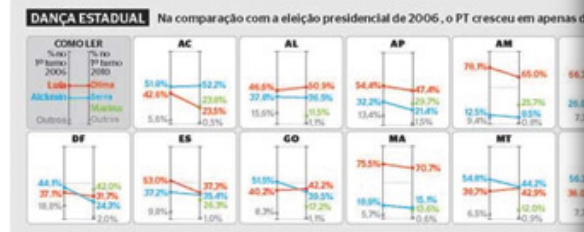
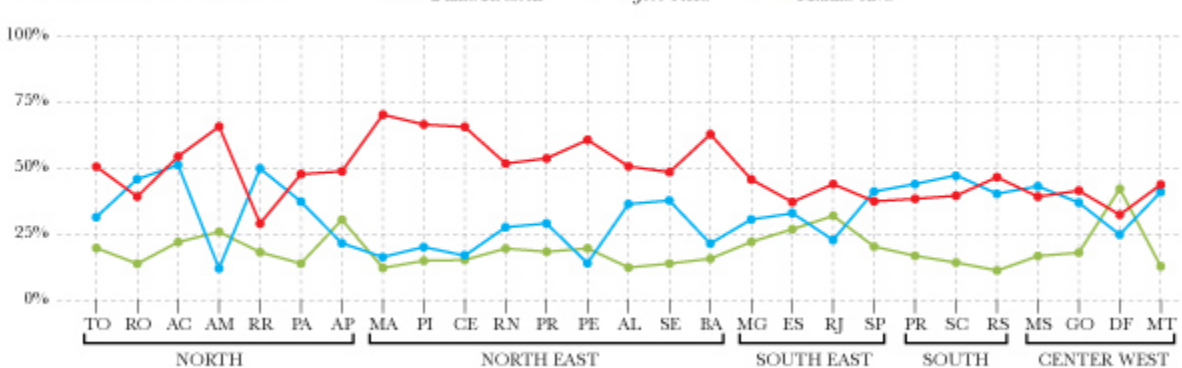
Os cientistas políticos explicam algumas particularidades regionais na escolha entre Dilma, Marina e Serra

- RORAIMA:** A preferência por Serra pode ser efeito da regularização das terras indígenas de Raposa Terra do Sol, que teria afetado a economia local.
- ACRE:** No estado de Marina, Serra venceu. Ela teve 35% em Rio Branco e venceu parte dos eleitores do governador Tião Viana (PT). Com as bases divididas, Dilma perdeu.
- MUNICÍPIOS DO NORDESTE:** No reduto mais forte do governo Lula, Serra venceu em poucas localidades devido a política municipal. Em Urucui, no Piauí, o punter e o prefeito Valdir Soares (PT) impuseram a sua base.
- PARÁ:** A política fundiária e ambiental do governo pode ter afetado interesses do setor pecuario e o PSD local. O ex-governador e agora candidato no Simão Jatene (PSDB) possuiu votos para Serra.

O gráfico mostra os percentuais obtidos por Dilma, Serra e Marina em cada Estado. A concentração dos votos de Dilma no Nordeste fica evidente



How each state voted





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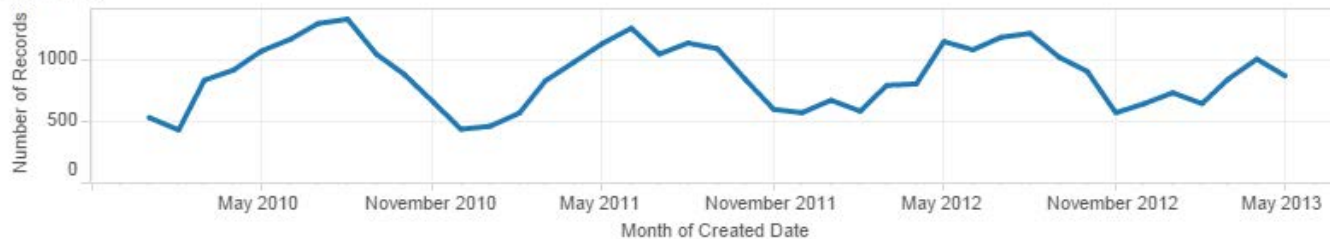
Week 6
Nov 17, 2015

Basic Timelines – Working with Dates

Yearly continuous



Monthly



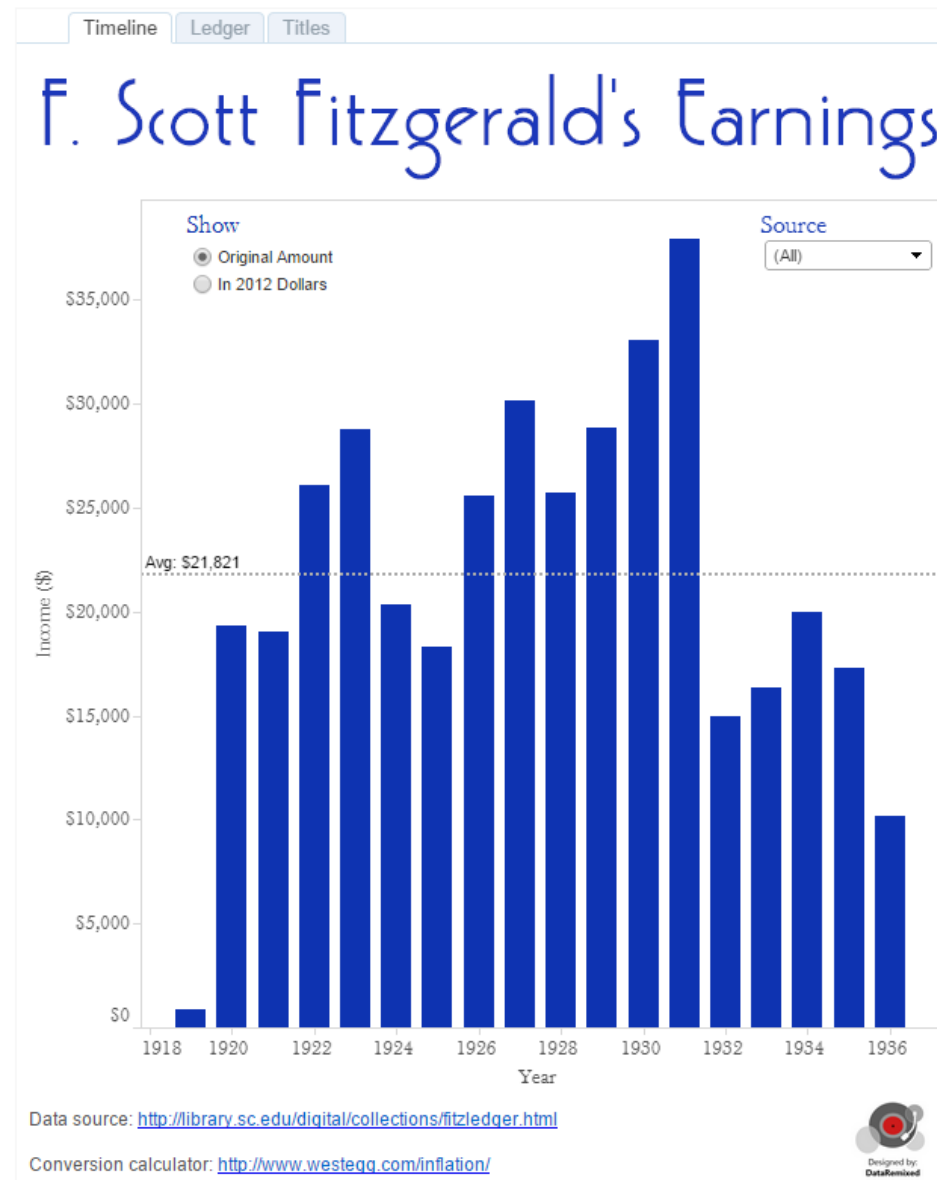
Weekly



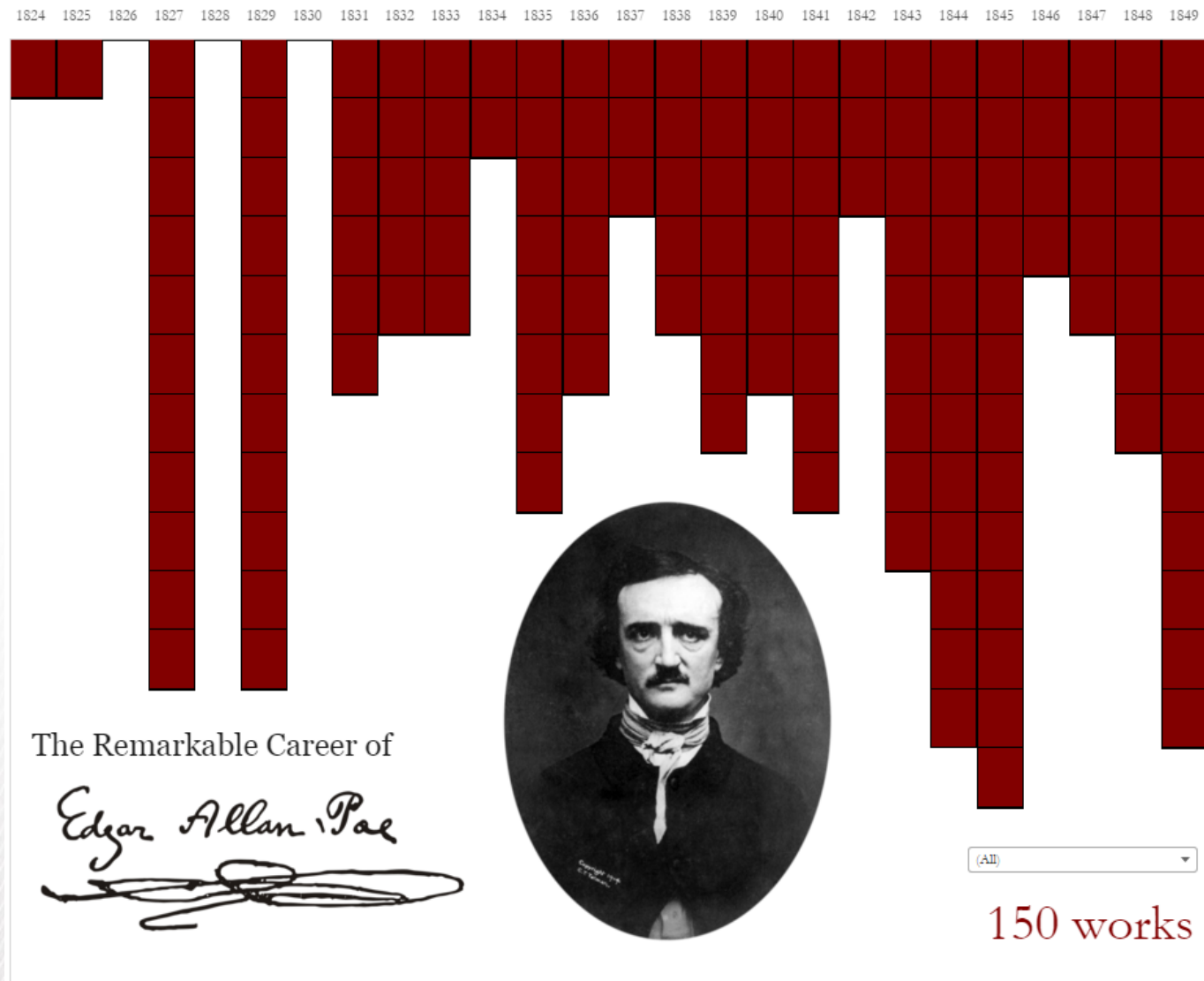
Daily



Column Charts

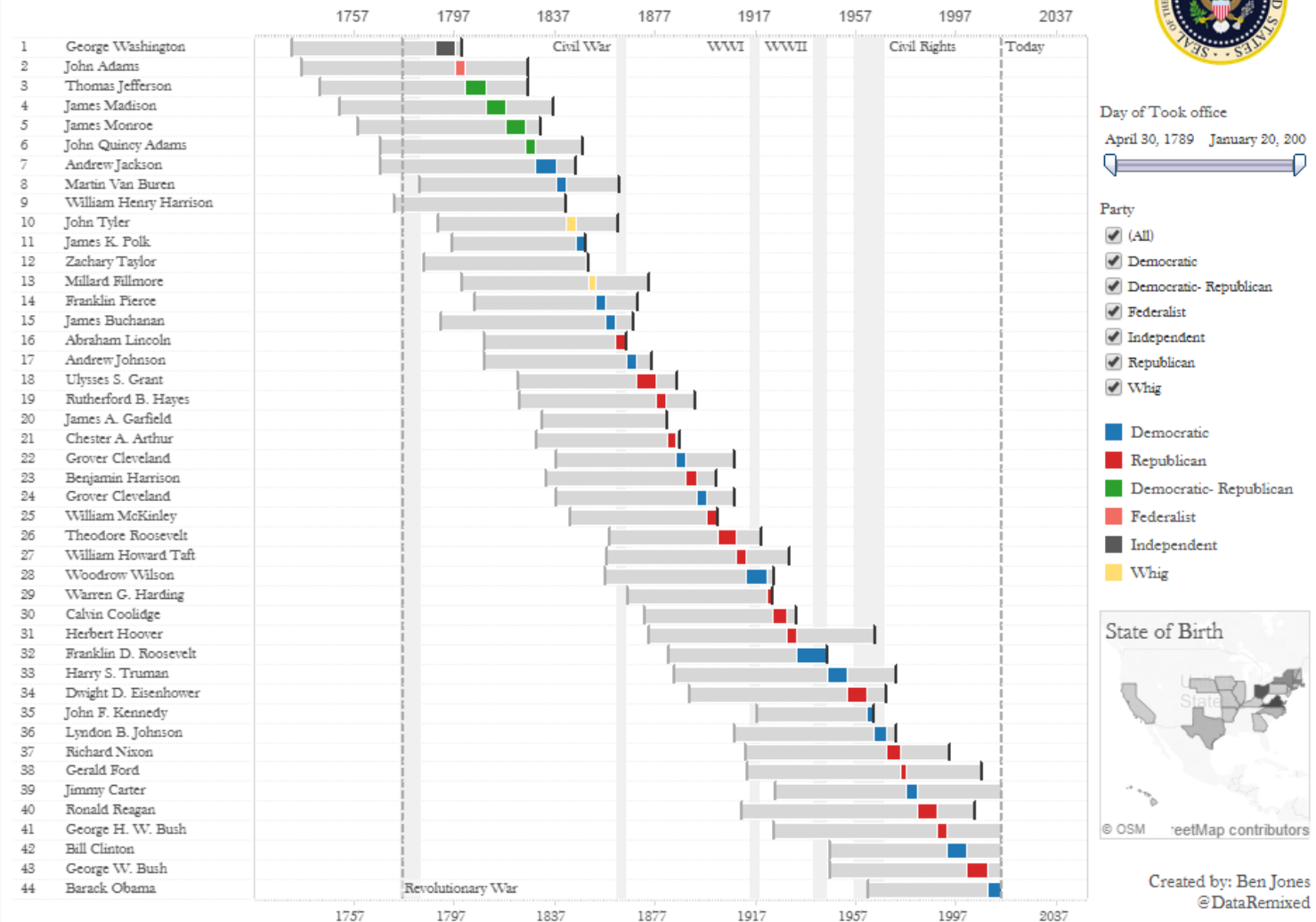


Inverted Column Charts



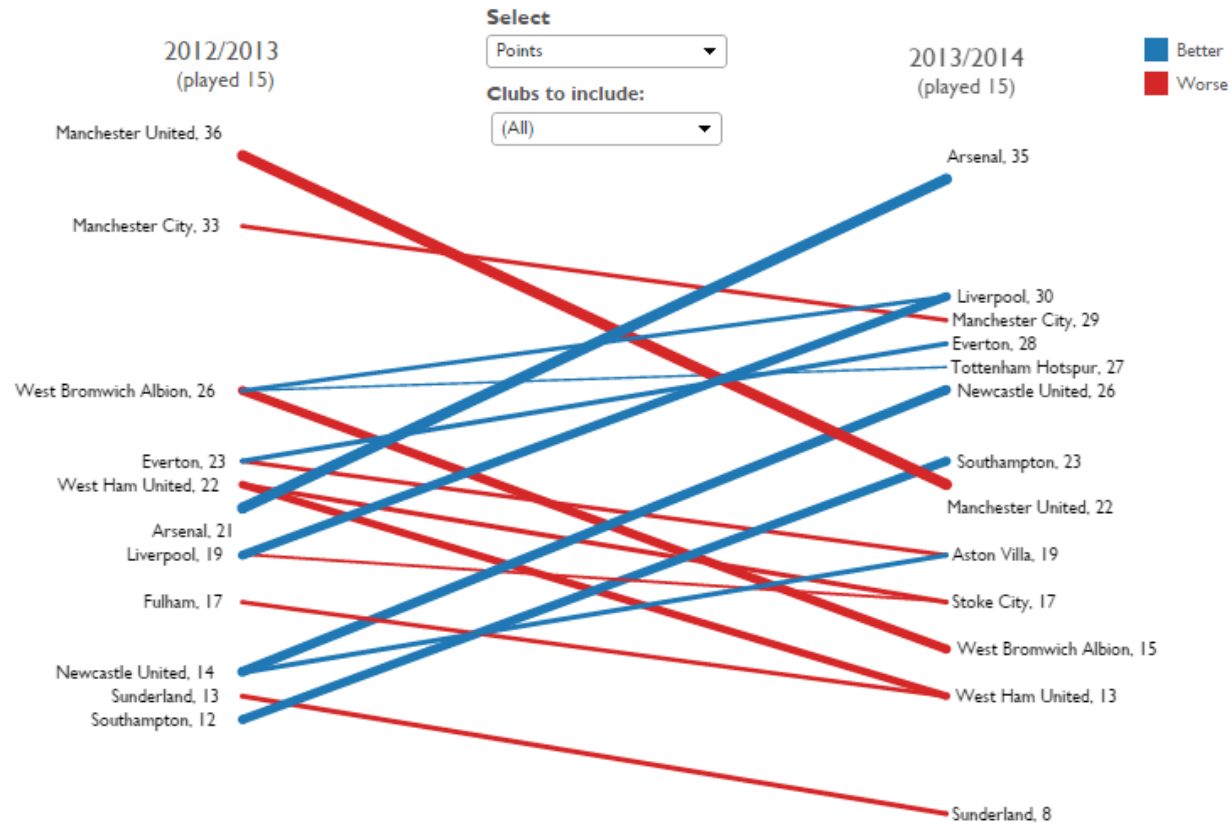
Gantt Charts

A PRESIDENTIAL GANTT CHART



Slopegraphs

Barclay's Premier League Tables: Comparing 2012/2013 Starts to 2013/2014 Starts



Data:



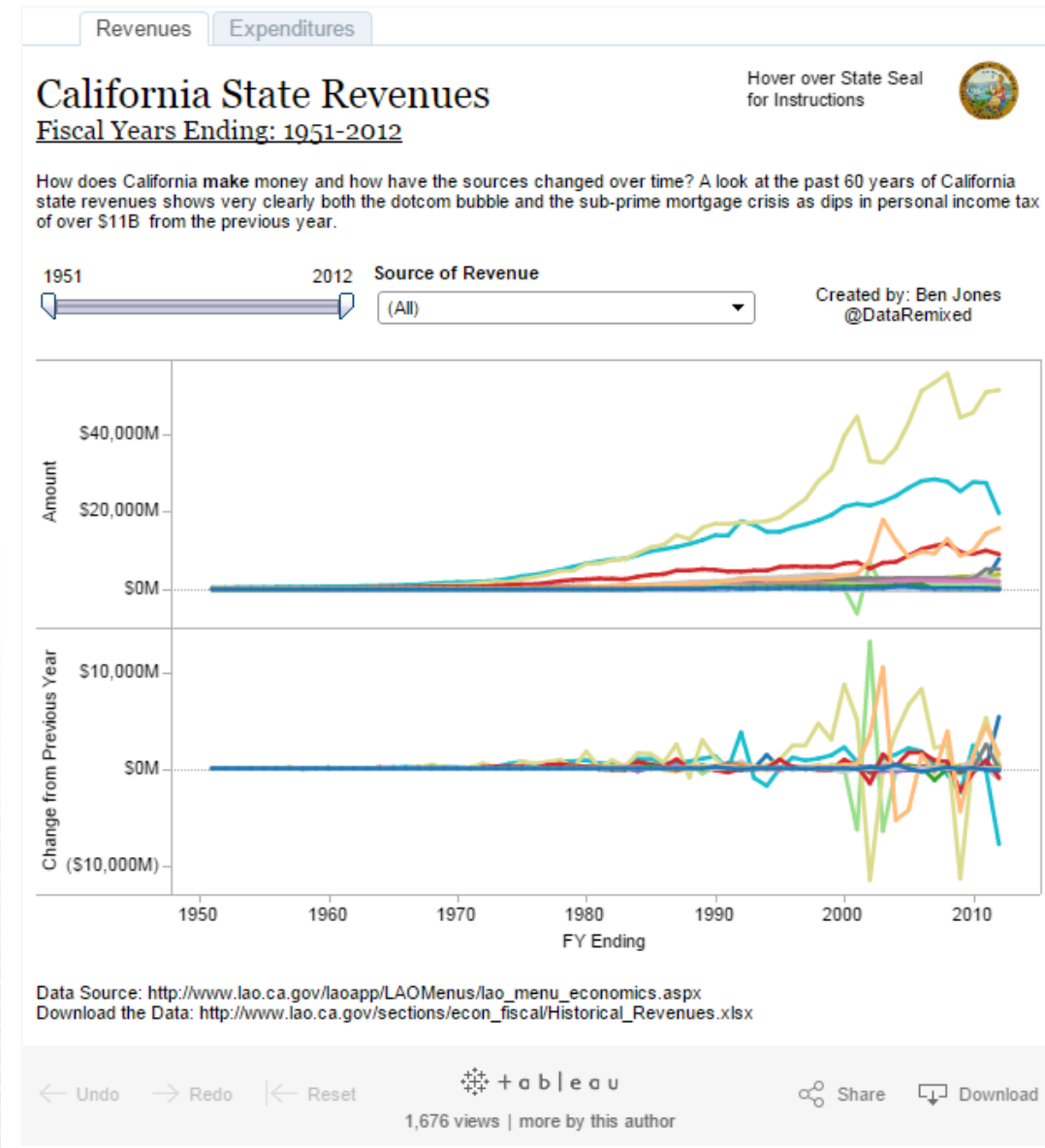
Ref:



By:



Change from Previous



Connected Scatterplots

MLB Stats Over Time: Scatterplots vs. Dual Axes



Choose Variable 1

Number of Pitchers

Choose Variable 2

Strikeouts

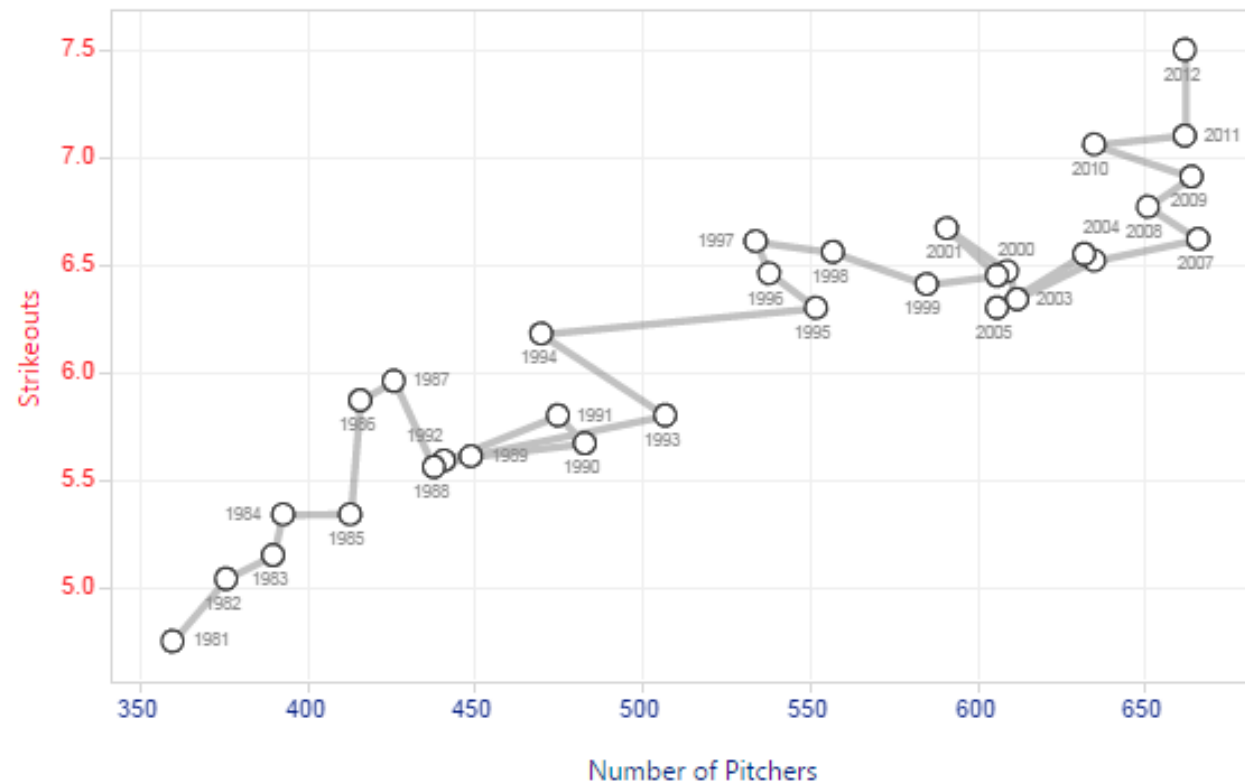
Select a Year Range

1981

2012

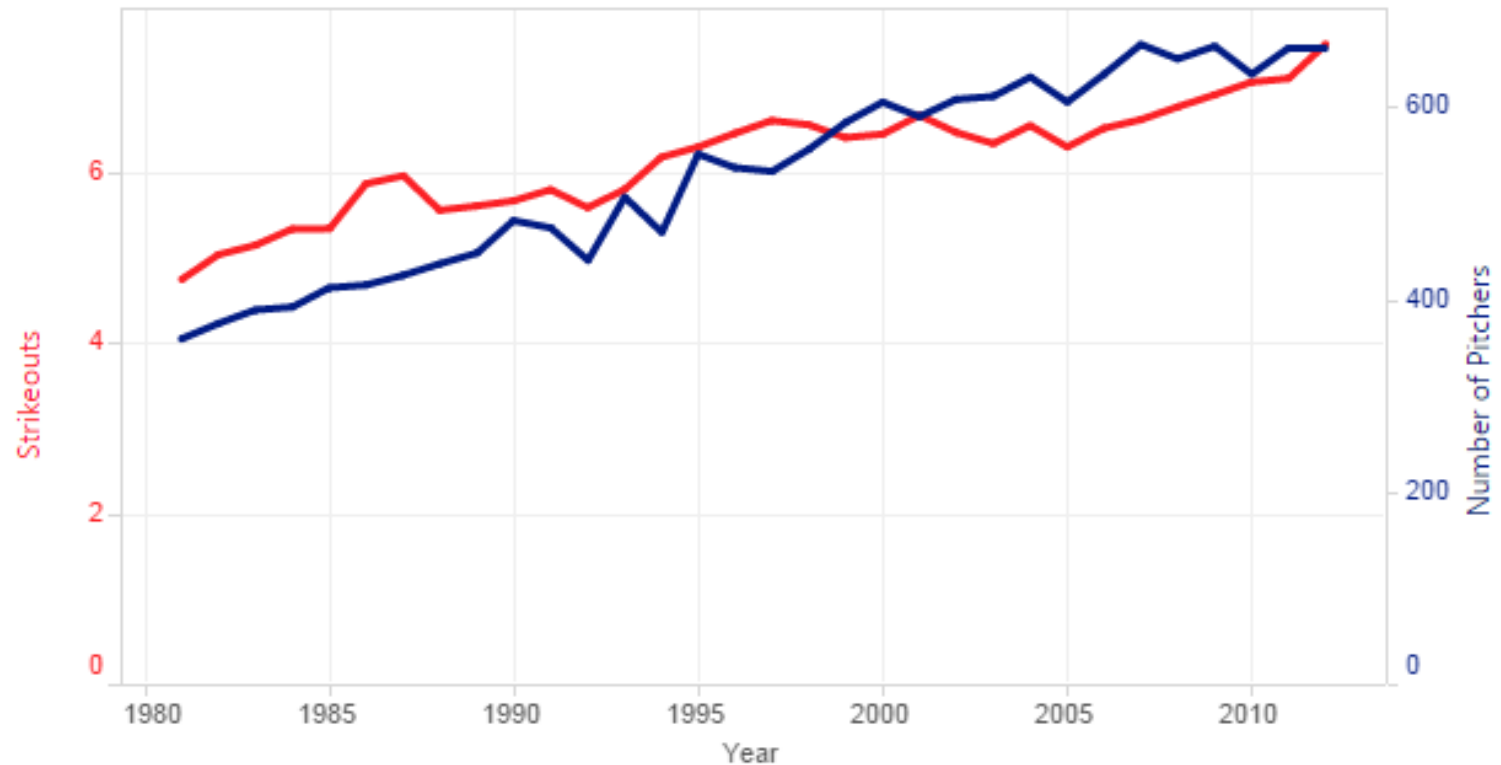


Method #1. The Connected Scatterplot



Dual Axis Line Plots

Method #2. Dual Axis Line Plots



Source | <http://www.baseball-reference.com/leagues/MLB/pitch.shtml>

Ben Jones (@DataRemixed) | 5/4/2013

Week 6 Homework

- Read the chapters for the Week 7 Lecture:
 - Munzner, *Visualization Analysis & Design*, Ch. 8
 - Jones, *Communicating Data with Tableau*, Ch. 10-11
- Visualization
 - Find (or create) a data set that includes at least one time field and create a visualization that shows how a variable changes over time.