

Welcome



Science of Visual Analysis

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Gerard is a data engineer, data evangelist, and data strategist with customer advisory experience working for Tableau, and previously Vertica and Informatica and management consulting experience previously working for Accenture and PricewaterhouseCoopers.



Jerry Valerio

§ Foodie since girth and it shows!

- Side hustles as adjunct professor and data science bootcamp instructor.
- Sky-dived (tandem) and also zip-lined once because YOLO!



Audience

- Basic knowledge of statistics
- New to Tableau

Why Visual Analysis? Example I



Anscombe's Quartet

Let's analyze some data ...

I		II		III		IV	
x	y	x	y	x	y	x	y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.1	4	5.39	19	12.5
12	10.84	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

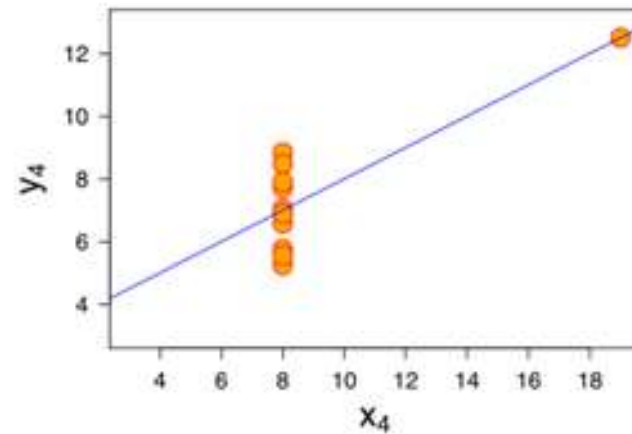
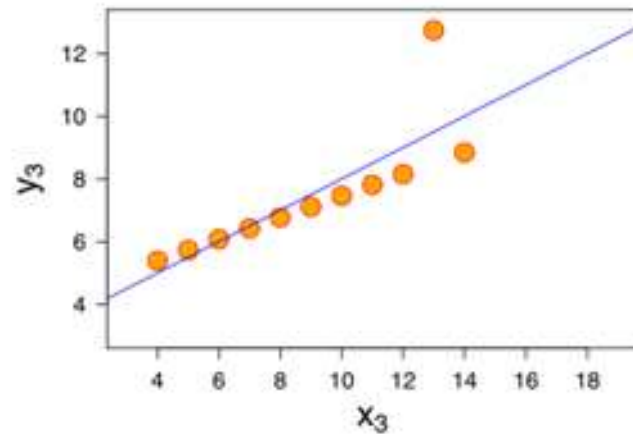
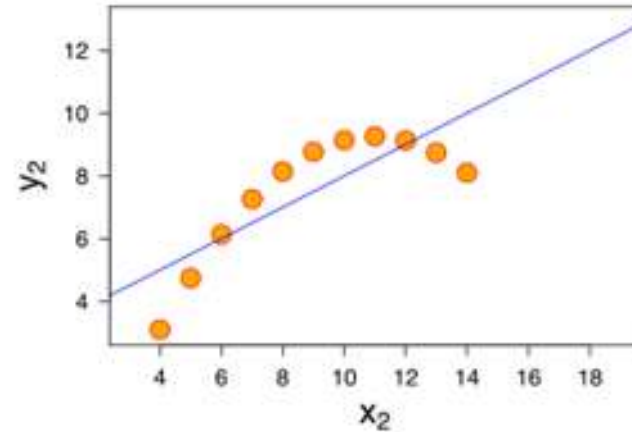
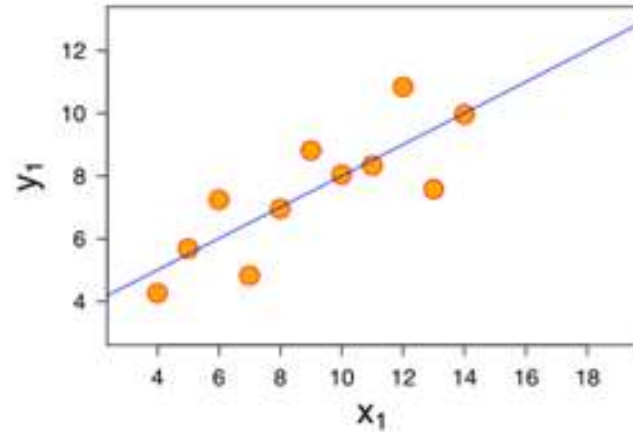
Anscombe's Quartet

Let's summarize the data ...

Property	Value
Mean of x in each case	9 (exact)
Variance of x in each case	11 (exact)
Mean of y in each case	7.50 (to 2 decimal places)
Variance of y in each case	4.122 or 4.127 (to 3 decimal places)
Correlation between x and y in each case	0.816 (to 3 decimal places)
Linear regression line in each case	$y = 3.00 + 0.500x$ (to 2 and 3 decimal places, respectively)

Anscombe's Quartet

Let's visualize the data ...



Why Visual Analysis? Example II



3	3	0	3	0	1	8	7	6	8	2	1	4	0	3	8	3	7	7	2	0	5	2	3	2	7	0	2	0
7	1	4	6	0	2	1	3	2	7	6	0	2	5	6	3	2	5	7	6	3	3	0	2	0	3	0	7	2
8	7	5	7	2	8	3	8	7	7	8	2	0	7	7	5	2	3	1	1	5	6	3	8	4	7	8	2	0
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2	4	3	1	3	5	4	9	5	0	7	6	0	7	4	3	1	8	2	7	3	4	6	0	2	4	8	2	3
8	6	2	2	6	5	4	6	7	0	7	6	0	0	3	9	0	2	4	7	1	7	2	3	3	5	8	7	0
0	8	4	5	1	3	1	7	6	4	5	4	1	2	4	5	3	3	5	4	9	6	7	7	6	3	4	2	5
4	7	7	0	2	2	0	1	1	7	7	7	0	2	6	6	4	7	5	8	6	1	4	3	7	8	5	4	6
4	3	6	6	4	6	6	2	8	4	8	5	3	7	8	8	1	3	8	5	4	5	7	4	0	3	2	8	4
5	5	0	3	5	3	5	3	8	3	2	3	8	2	3	1	6	2	7	2	4	6	3	6	4	4	3	2	5
4	4	0	2	1	7	2	4	4	7	4	1	9	2	4	5	2	5	0	4	0	0	5	3	6	3	3	6	7
7	4	6	6	8	7	5	7	9	2	0	2	8	8	8	8	3	2	4	2	6	4	0	4	6	3	7	2	1
0	1	7	1	5	9	1	4	2	8	7	3	7	1	4	5	1	8	7	8	0	5	1	7	0	5	8	8	1
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0	5	2	4	1	5	3	3	1	5	5	1	4	0	1	6	4	3	3	9	8	8	3	4	6	8	4	8	6
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4	4	8	3	3	3	5	0	1	0	3	8	6	3	2	0	5	0	6	1	3	3	4	3	6	1	5	8	6
1	0	2	2	7	6	3	3	0	8	8	0	3	1	8	8	1	2	1	7	5	2	9	3	5	8	3	2	5

3	3	0	3	0	1	8	7	6	8	2	1	4	0	3	8	3	7	7	2	0	5	2	3	2	7	0	2	0
7	1	4	6	0	2	1	3	2	7	6	0	2	5	6	3	2	5	7	6	3	3	0	2	0	3	0	7	2
8	7	5	7	2	8	3	8	7	7	8	2	0	7	7	5	2	3	1	1	5	6	3	8	4	7	8	2	0
0	5	0	5	1	6	1	7	5	6	8	0	4	4	6	7	4	7	1	4	0	0	8	4	4	3	0	3	2
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7	4	6	6	8	7	5	7	9	2	0	2	8	8	8	8	3	2	4	2	6	4	0	4	6	3	7	2	1
0	1	7	1	5	9	1	4	2	8	7	3	7	1	4	5	1	8	7	8	0	5	1	7	0	5	8	8	1
2	8	5	2	1	2	8	7	7	6	2	5	6	2	6	4	1	5	1	6	1	2	1	1	0	5	6	4	0
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1	0	2	2	7	6	3	3	0	8	8	0	3	1	8	8	1	2	1	7	5	2	9	3	5	8	3	2	5

Pre-attentive Processing



Pre-attentive Visual Attributes

Length



Width



Orientation



Size



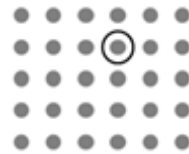
Shape



Curvature



Enclosure



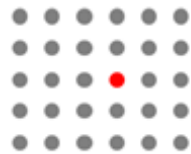
2-D Position



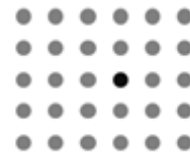
Spatial Grouping



Color (Hue)



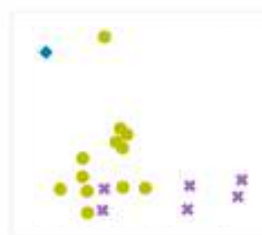
Color (Intensity)



Gestalt Laws of Grouping



Proximity



Similarity



Enclosure



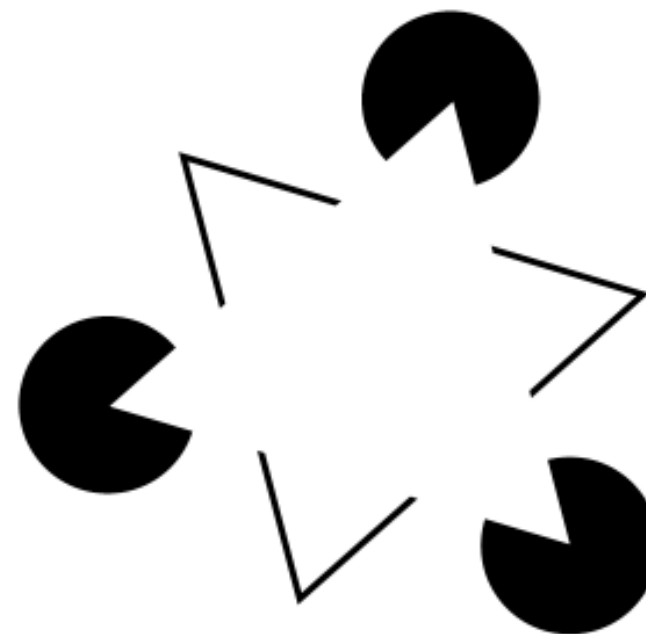
Closure



Continuity



Connection



Continuity

Writing and Numbers were late to the Party



- Attributes are universal* whereas Numbers are not

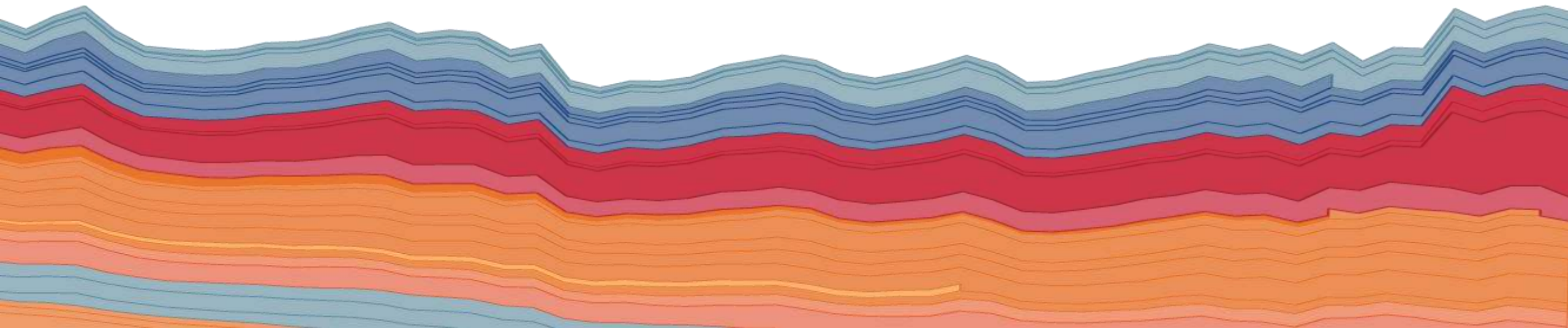
○	ZERO LING	一	ONE YAT	二	TWO YEE
三	THREE SAM	四	FOUR SAY	五	FIVE MM
六	SIX LOK				
九	NINE GOW				
Number	Japanese	Pronunciation			
1	いち	i-chi			
2	に	ni			
3	さん	san			
4	よん・し	yon; shi			
5	ご	go			
6	ろく	ro-ku			
7	なな・しち	na-na-shi-chi			
8	はち	Ha-chi	European	0	1
9	きゅう・く	kyuu	Arabic-Indic	٠	١
10	じゅう	jyuu	Eastern Arabic-Indic (Persian and Urdu)	٠	١
			Devanagari (Hindi)	०	१
			Tamil	௦	௧
			Telugu	౦	౧

	WESTERN	ROMAN	KANJI-CHINESE	THAI	FARSI	ARABIC-EGYPT	NEPALI
1	I	一	一	๑	۱	١	१
2	II	二	二	๒	۲	۲	२
3	III	三	三	๓	۳	۳	३
4	IV	四	四	๔	۴	۴	๔
5	V	五	五	๕	۵	۵	๕
6	VI	六	六	๖	۶	۶	๖
7	VII	七	七	๗	۷	۷	๗
8	VIII	八	八	๘	۸	۸	๘
9	IX	九	九	๙	۹	۹	๙
10	X	十	十	๑๐	۱۰	۱۰	๑๐
11	XI	十一	十一	๑๑	۱۱	۱۱	๑๑
12	XII	十二	十二	๑๒	۱۲	۱۲	๑๒

0	1	2	3	4	5	6	7	8	9
•	١	٢	٣	٤	٥	٦	٧	٨	٩
•	١	٢	٣	٤	٥	٦	٧	٨	٩
०	१	२	३	४	५	६	७	८	९
	௦	௧	௨	௩	௪	௫	௬	௭	௮
౦	౧	౨	౩	౪	౫	౬	౭	౮	౯

* with some cultural differences

What is Visual Analysis?



“Visual analysis is the representation and presentation of data that exploits our visual perception abilities in order to amplify cognition.”

- Andy Kirk, author of “Data Visualization: a successful design process”

Thank You

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