

Text Analysis

Introduction to Data Visualization

The Graduate Center at CUNY | Summer 2018

June 12, 2018

Five Minute Reflection

Moretti presents us with a problem: “a canon of two hundred novels sounds very large for nineteenth-century Britain, but is still less than one per cent of the novels that were actually published: twenty thousand, thirty, more, no one really knows—and close reading won’t help here, a novel a day every day of the year would take a century”—Moretti, 2003, pg 1.

Computers cannot “read” the way people do. Given this, do you think that reading these texts computationally (distant reading) is possible? Why or why not? Do you think there is anything to be gained in this approach?

Texts as Data

- Corpus/Corpora
- Collection of documents
 - Tweets
 - Books
 - Zines
 - Text messages
 - Newspaper Articles
 - Supreme Court proceedings

Working with text

- Given a text, what can you quantify?

Working with Corpora

MetaData

- Date (Time)
- Location
- Creators (author, publisher, etc.)
- Platform/Format
- Sales/Retweet/Distribution
- Length
- Keywords
- Title
- Revision History

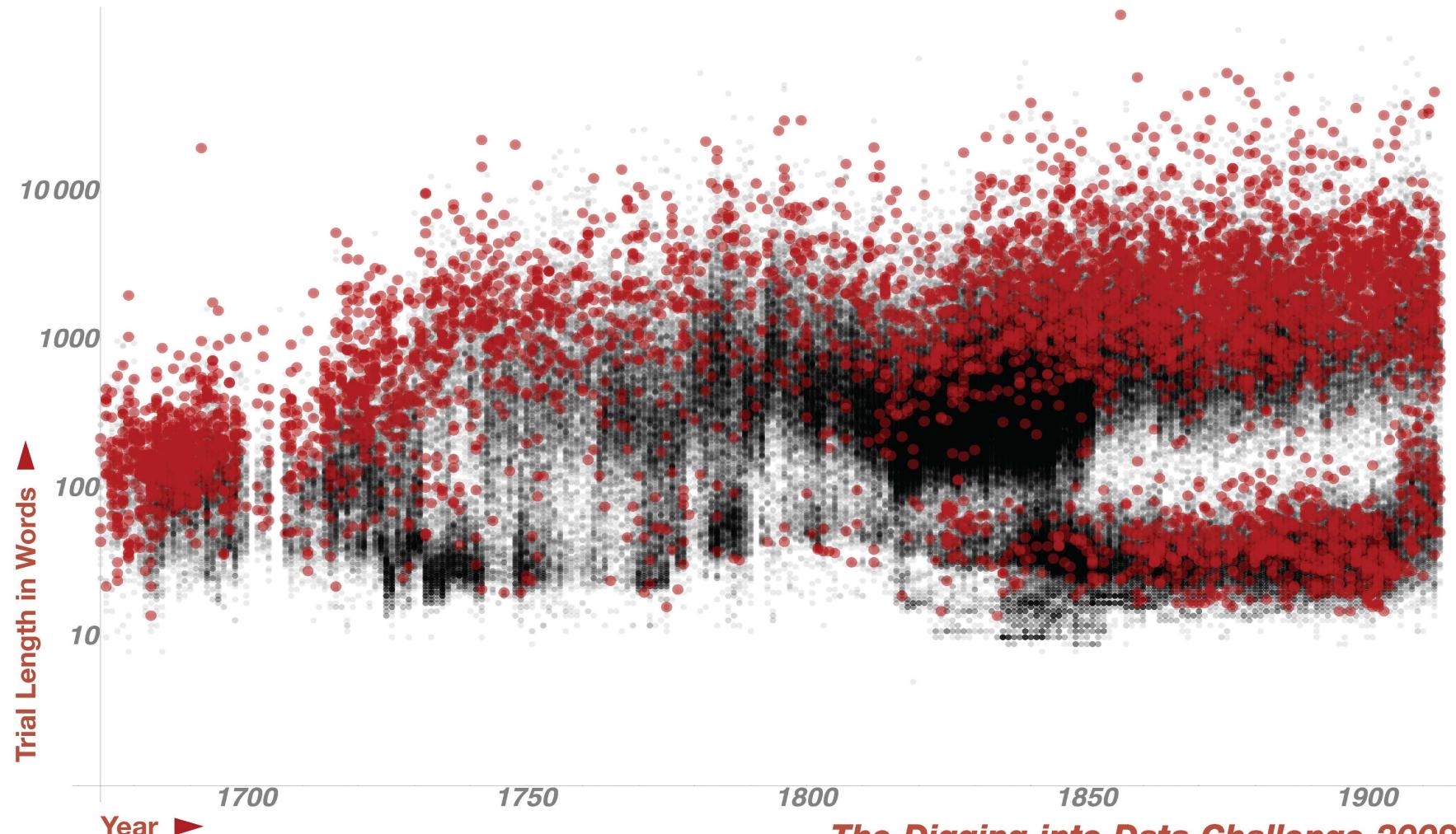
Content

- Word frequencies
- N-grams
- Word offset
- Topic Modelling
- Sentiment Analysis
- Predictions

Data Mining With Criminal Intent

Cyril Briquet • Dan Cohen • Frederick Gibbs • Tim Hitchcock • Jamie McLaughlin • Geoffrey Rockwell
Joerg Sander • Robert Shoemaker • John Simpson • Stéfan Sinclair • Sean Takats • William J. Turkel

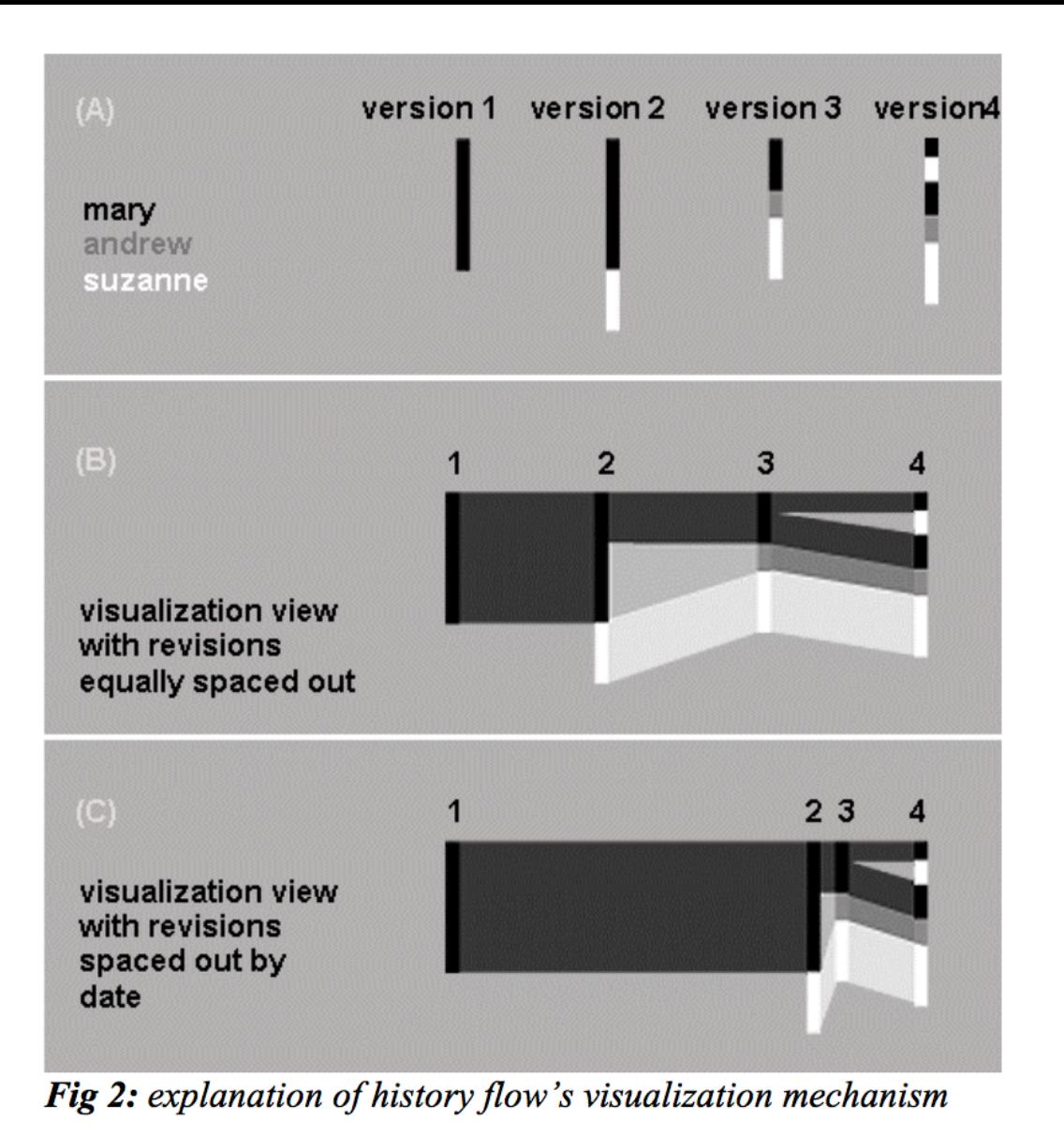
Metadata



Length in words of trials involving 'killing' (red) versus all other trials (black) from the Old Bailey Proceedings, plotted with a logarithmic scale for the x axis. 197,745 Trials.

The Digging into Data Challenge 2009

NEH • JISC • SSHRC



Visualizing Edits

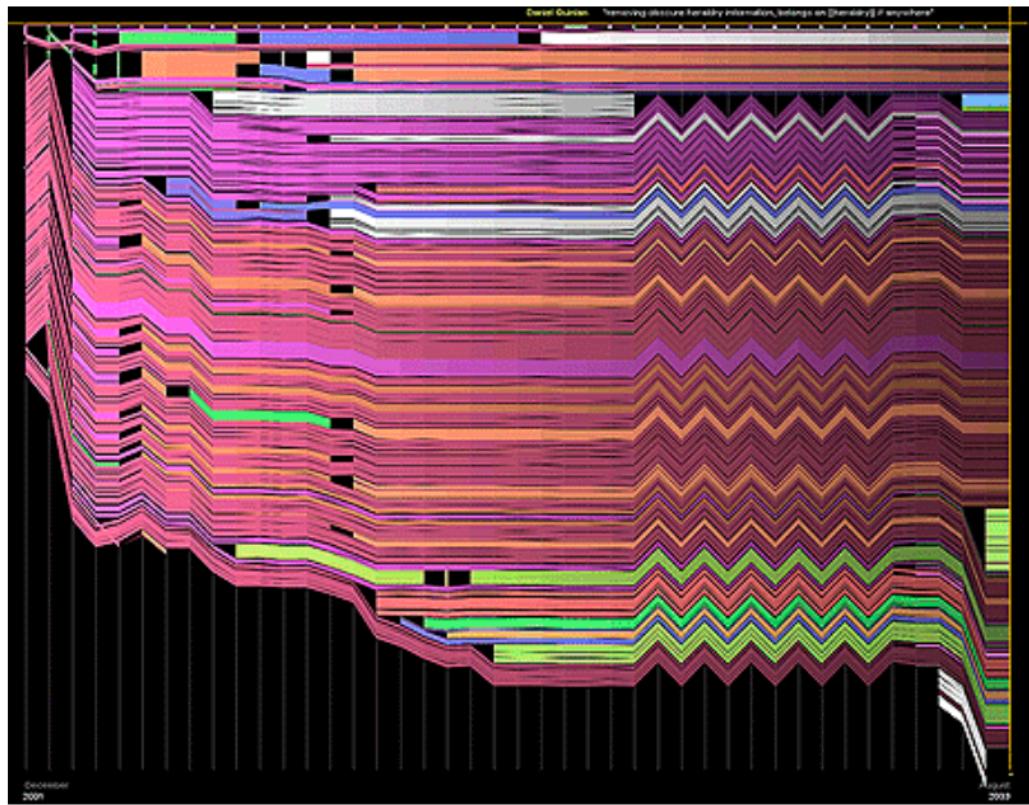


Fig 6: “Chocolate” page spaced out by number of versions; we can see the zigzag pattern of an edit war.

Visualizing Text

Metadata

- Darwin's Origin of the Species
Edits <https://fathom.info/traces/>

Content

- Presidential Debates (n-grams)
https://public.tableau.com/views/Election2016-SpeechAnalysis/Newspaper?:embed=y&:display_count=yes&:toolbar=no&:showVizHome=no
- <https://books.google.com/ngrams/>

Metadata

- Can usually be formatted for visualization with minimal cleaning
- Categorical or Numerical
- Tells a story about the text



Working with Text

Some Cleaning

- Word Counts/Frequencies
- Offsets
- N-grams

A Lot of Cleaning

- Comparing two or more texts
- Lexical Density/Diversity
- N-grams
- Topic Modelling
- Sentiment Analysis
- Predictions

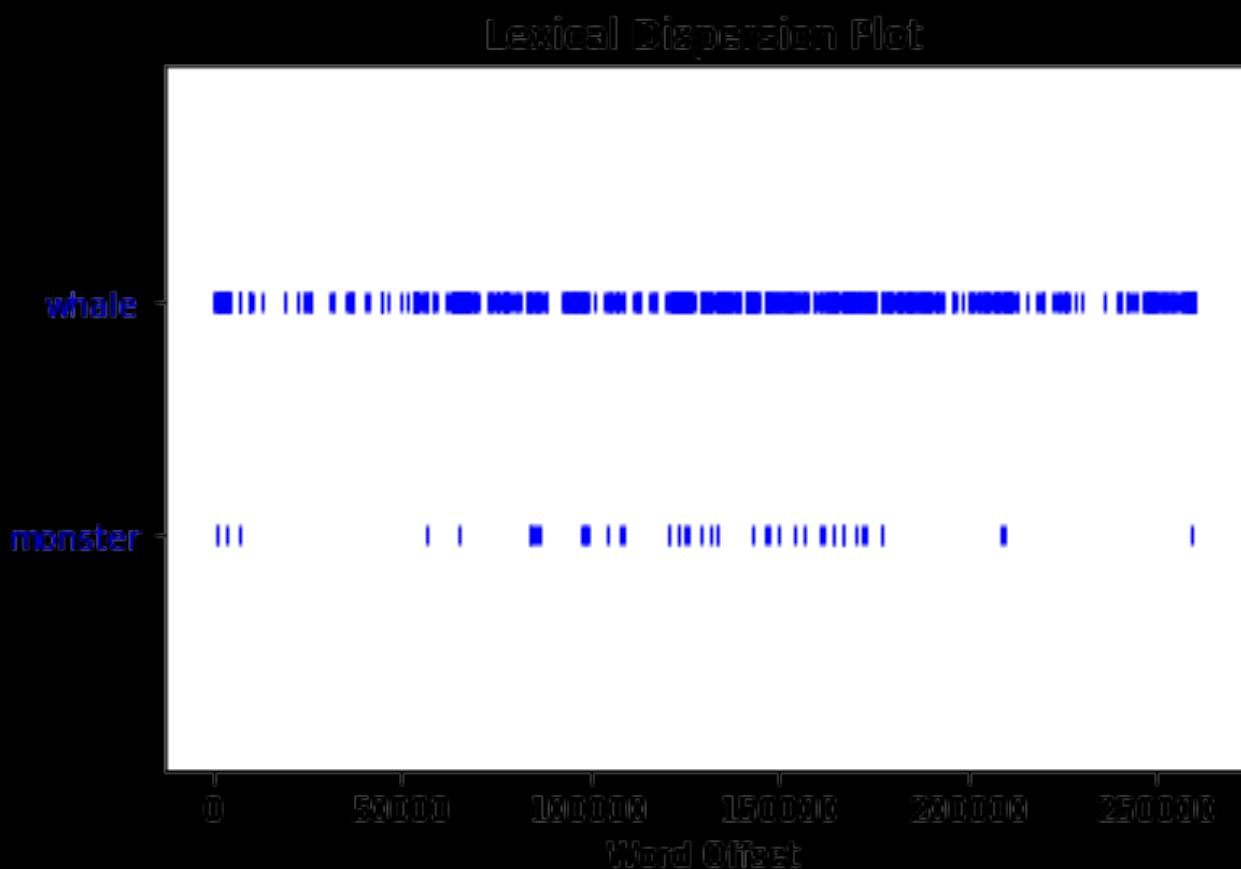
Cleaning Text

DON'T DO THIS WITH TABLEAU

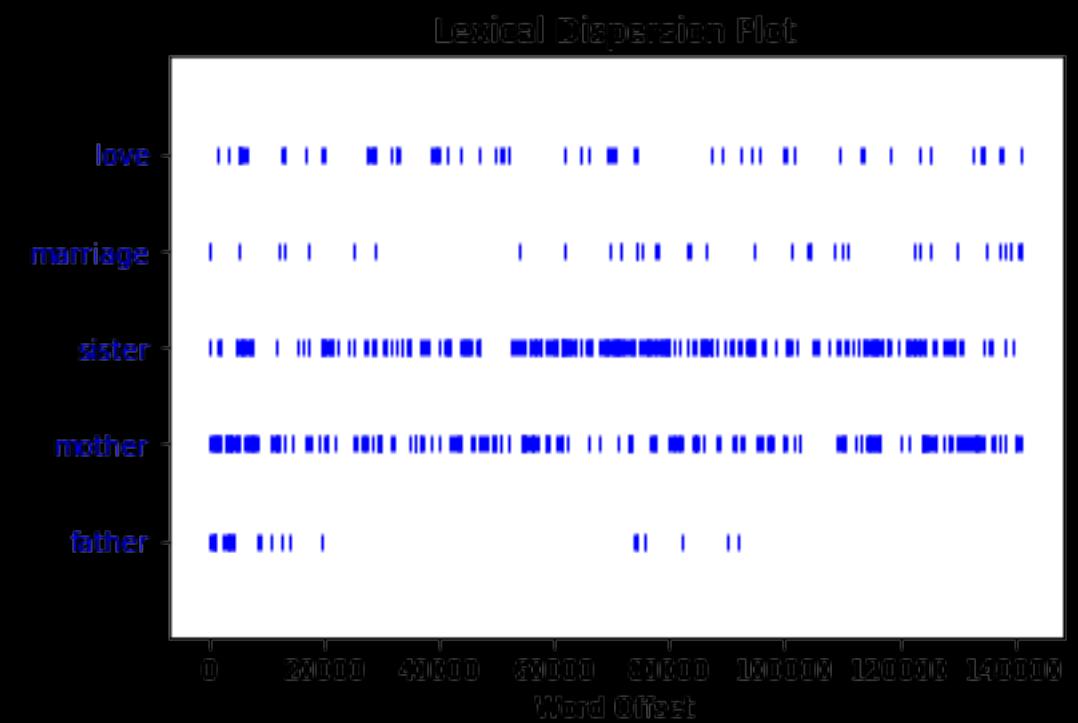
- Tokenize (split into words)
- Normalize (remove punctuation and capitalization)
- Remove Stopwords (determiners, prepositions, auxiliaries, etc.)
- Stem or Lemmatize (transform “run”, “runs”, and “running” into “run”)

Frequency Distributions

Moby Dick (Herman Melville)



Sense and Sensibility (Jane Austen)



Cleaning Text

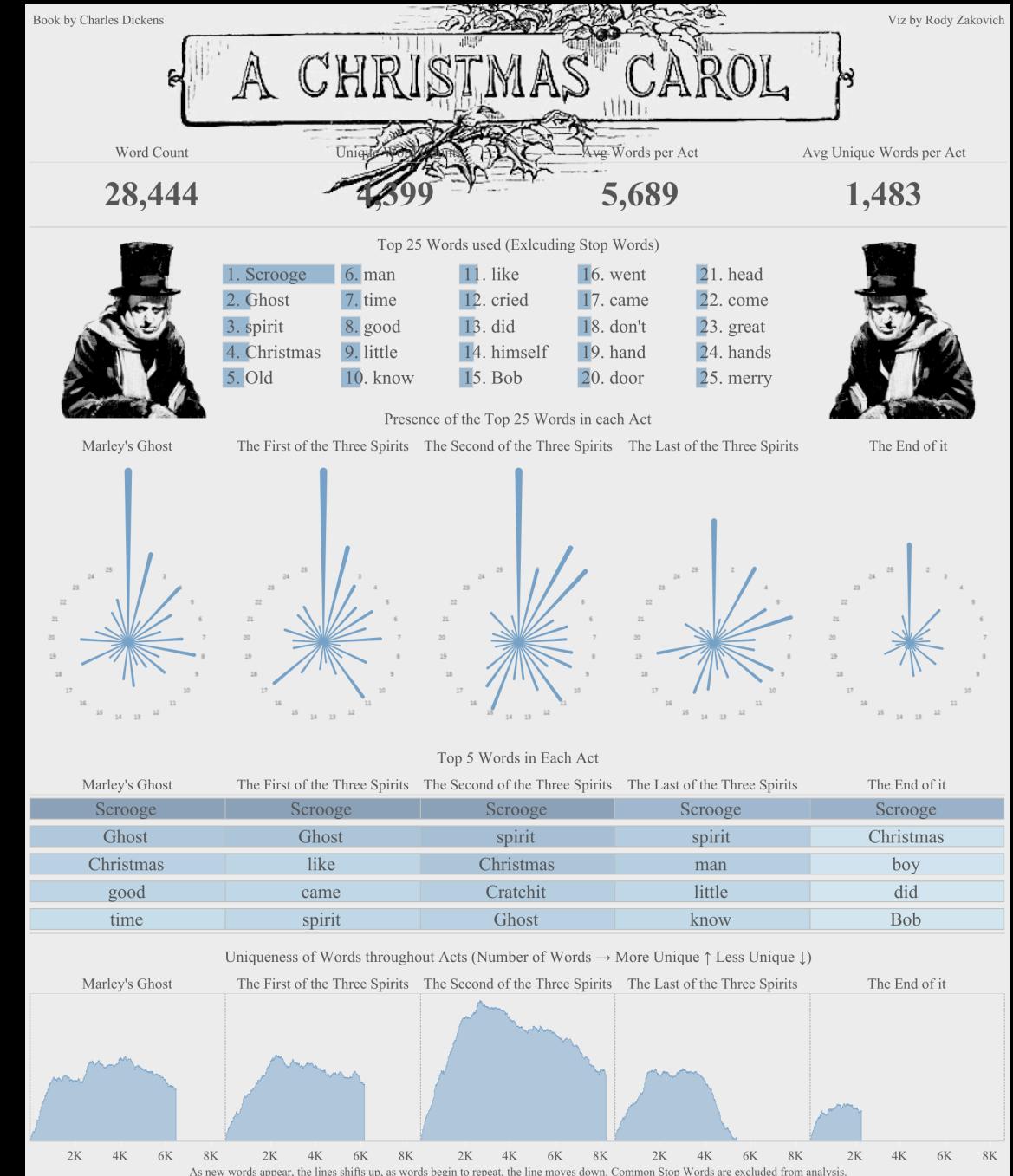
Hunger Games (Dirty Text)

1 by 1s 2 3 4 5 6 7 7:00 8 8:30 8th 9 10 11 12. 12s 13 13's 13s 14 15 15:00 16 17 18 18:00 18:30 19 19:1 20 21 22 22:00
2:30 23 24 25 25.Mutations 26 27 39 75 100 150-pound 220-pound 250 307 451 2212 3901 3902 3903 3908 `` - -- -a -Leeg -takes -there -to -two
, ; : ! ? " "Because 'Bring 'd Fire 'I 'll 'm 'Next 'propaganda 're 's 'seize 'Star 'the 'The Thirteen 'to 've 'we 'Year () A a Aa
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abnormally aboard abounds about ABOUT About above Above aboveground abrasive abreast abrupt abruptly absconded absence absences absent absenty
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abuses abusing abyss accelerated accent accents accept acceptable accepted accepting accepts access accessible accessories accessory accident accidental
accidentally accidents accommodate accompanied accompanies accompany accompanying accomplished accomplices accomplish accomplished according account accountable
accounted accounts accumulated accuracy accurate accurately accusation accusations accused accusingly accustomed ace acerbic ache aches achieve achieved
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adrenaline Adrenaline Adrienne adult adults advance advanced advantage adventures adversaries advice advisable advises advisor advisors aerial
aerodynamics affair affect affectations affected affecting affection affectionate affects affixed affixes afford afforded afield afloat afoot afraid Afraid After
after aftereffects aftermath afternoon afternoons afterward Again again Against against age aged agenda agent ages aggravating
aggravation aggression aggressive aghast aging Agitated agitation ago agonies agonized agonizing Agonizing agony agree agreed Agreed agreeing agreement
agrees Agriculture agriculture Ah ahead Ahh ahs aid ails Aim aim aimed aiming aimlessly Air air Airborne airborne aircraft aired airing airlift airpower airs
airspace airstrip Airtime airtime airways aisle ajar alarm alarmed alcohol alcove alert alerted alertness alerts alibi alien alight
alignment alike alive All All all-consuming all-powerful all-too-familiar allied allegations allegiance alleviate alley alleys alliance alliances allied Allies
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anointed anonymous another Another another's anotherproblem another's answer answered answering answers anthem anthems anti-Capitol anti-climactic
anti-infection antiaircraft anticipate anticipated anticipates anticipating anticipation antics antidotes antisepic antlers Ants ants anxiety anxious
anxiously Any any anybody anymore Anyone anyone anyones Anything anything anytime anyway Anyway anywhere aorta apace apart Apart apartment
apartments apologetically apologize apologized apology apothecaries apothecary Appalachia appalled apparent Apparently apparently appeal appealing appear
appearance appearances appeared appearing appears appetite appetites appetizing applaud applauding applause apple apple-sized apples applesauce applications
applied applies apply appointed appointment appreciate appreciated appreciates appreciation appreciative apprehend apprehended Apprehensively approach
approached approaches approaching appropriate appropriated approval approved approving approximate apron aqua arbitrarily arbitrary arc arched archery
arching architectural arduous Are are Area area areas arena arenas arent argue argued argues arguing argument arguments arises arises arm armband
armed armful armies arming armload armor armored armory arms army aroma arose around Around arouse Arrange arrange arranged arrangement
arrangements arranges arranging array arrest Arrest arrested arrival Arrival arrivals arrive arrived arrives arrogance Arrogant arrogant arrow arrowheads ***

The Hunger Games (Clean Text)

n't see one even know peeta finnick mother says first time haymitch katniss two right better away something take think don't capitol like would people want stop much stay maybe plutarch set another anything tell mockingjay though airmoment sit must made remember never night together give course help hair theres voice twelve arm training hunger got hear prim keep ground watching everyone thing come everything feel although fingers effie realize help hair theres voice twelve arm training hunger got across anyone begin takes small table others ive three boggs comes rest floor gone part workstand try love team train goes cant real bad use pull boy skin far ever mean blood point seem move gives side hours guess open reach arms light cato girl kind yes

Cleaned Text Analysis



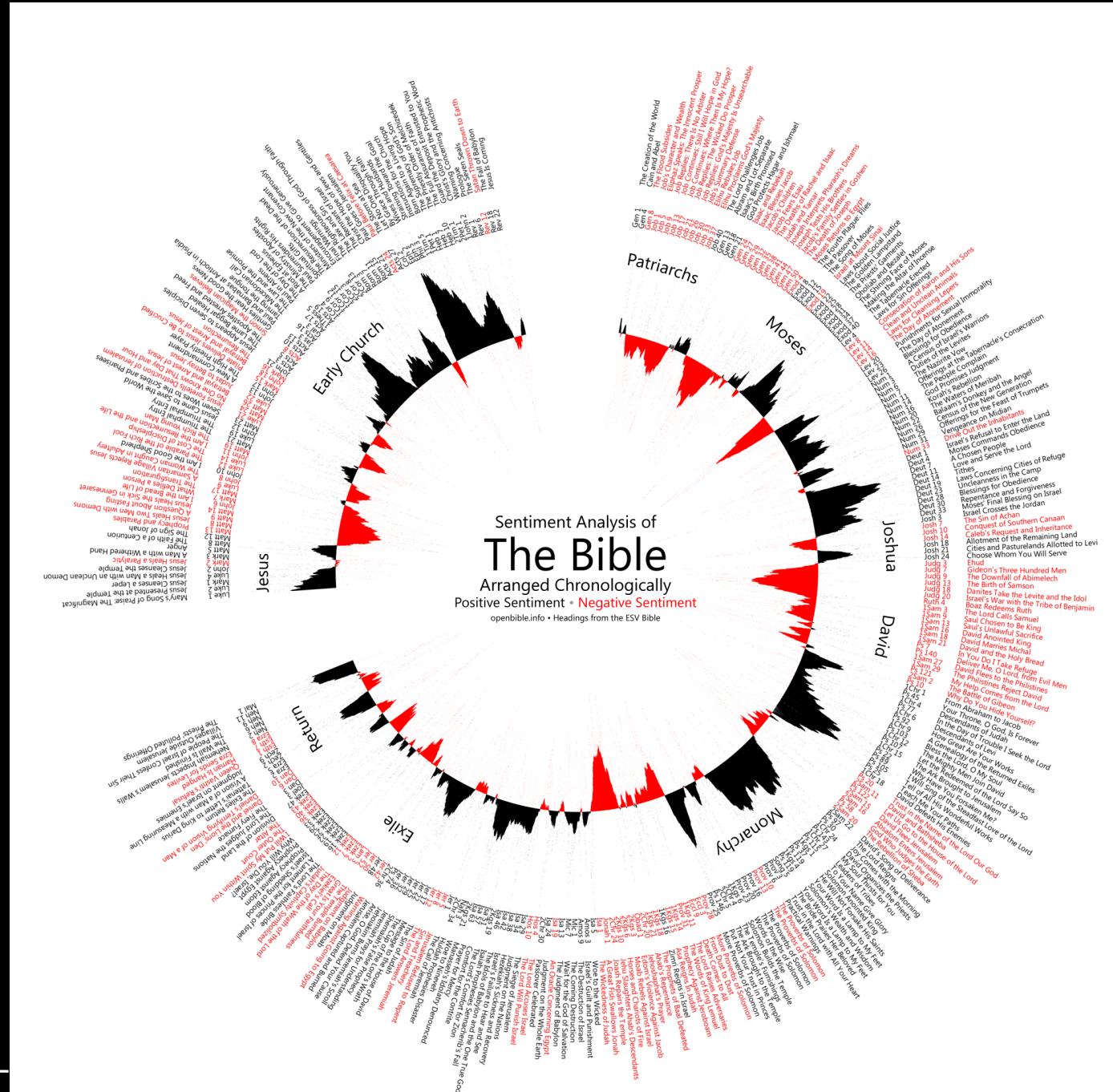
<https://public.tableau.com/profile/rody.zakovich#/vizhome/AChristmasCarolTextAnalysis/AChristmasCarolTextAnalysis>

Texts as visualizations: Sentiment Analysis

Sentiment analysis is a Natural Language Processing technique using Machine Learning

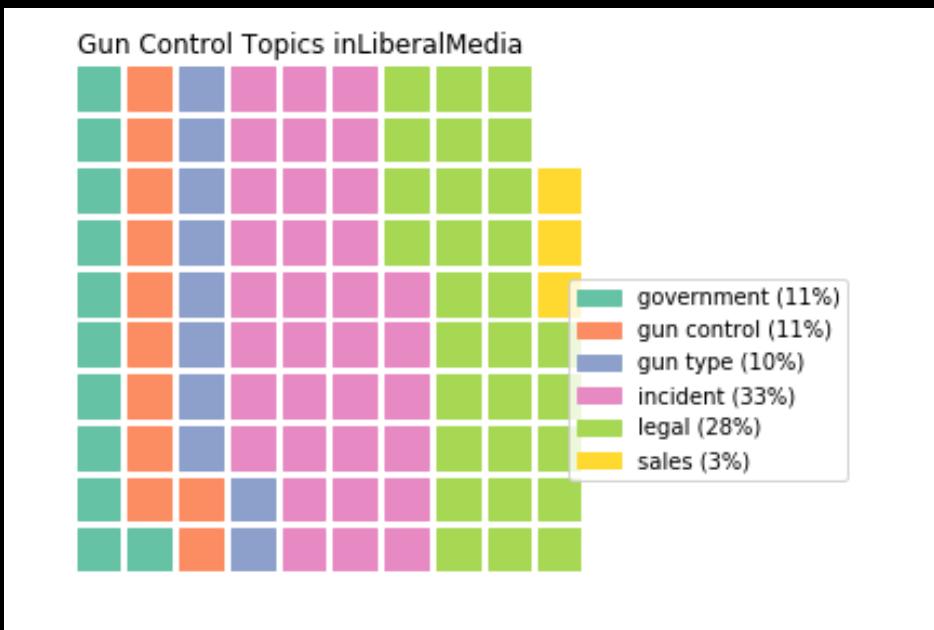
It is a Classification Task (labels each instance) to tag positive or negative usually based on a previously tagged corpus (but not always)

[https://www.biblegateway.com/blog/2011/10/the-ups-and-downs-of-the-bible-a-sentiment-analysis-](https://www.biblegateway.com/blog/2011/10/the-ups-and-downs-of-the-bible-a-sentiment-analysis/)



Texts as visualizations: Topic Modelling

Topic Modelling is a Natural Language Processing technique using Machine Learning



topicID	description
0	gun control violence shooting owner law mass america crime policy
1	police officer department incident city county video killed say man
2	ar 15 rifle automatic semi used round style shooter store
3	school student high shooting florida parkland medium dead control left
4	trump president white house wednesday policy ha support lawmaker also
5	one ha say like people think know would could use
6	state law carry enforcement public texas federal owner official local
7	get news whether often let say already told want life
8	video street 000 country want people show ha world shooting
9	firearm act gun federal home number according crime death handgun
10	shot killed shooting two man time fired one fire year
11	company store sale rifle ha year make group say end
12	check background sale system purchase gun record federal buy criminal
13	com second amendment twitter news follow bullet armed american host
14	nra national association member rifle group right republican political amendment
15	bill republican house legislation congress lawmaker measure would support president
16	new york city year old ha week part time street
17	said told official county member authority statement two attack home
18	read 2016 report attack weapon news control government member official
19	court right federal case amendment arm second law family handgun
20	wa year old told man report life went family one
21	weapon assault ban magazine rifle used automatic military style mass

Distant Reading

- Understanding literature through data
- Scientific Method
 - Hypothesis
 - Experiment
 - Analysis
- Topic Modelling / Sentiment Analysis
- Named Entity Recognition/ Relation Detection

Moretti

FIGURE 1. *The Hamlet network*

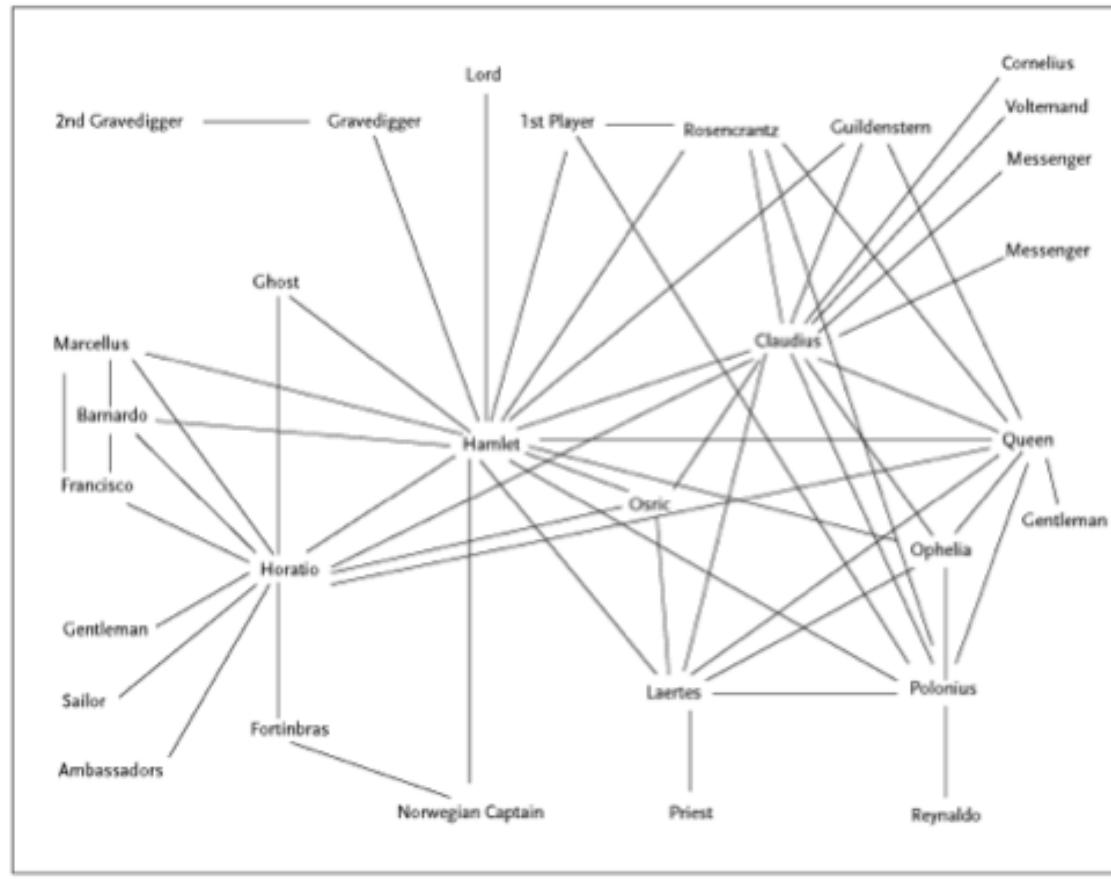
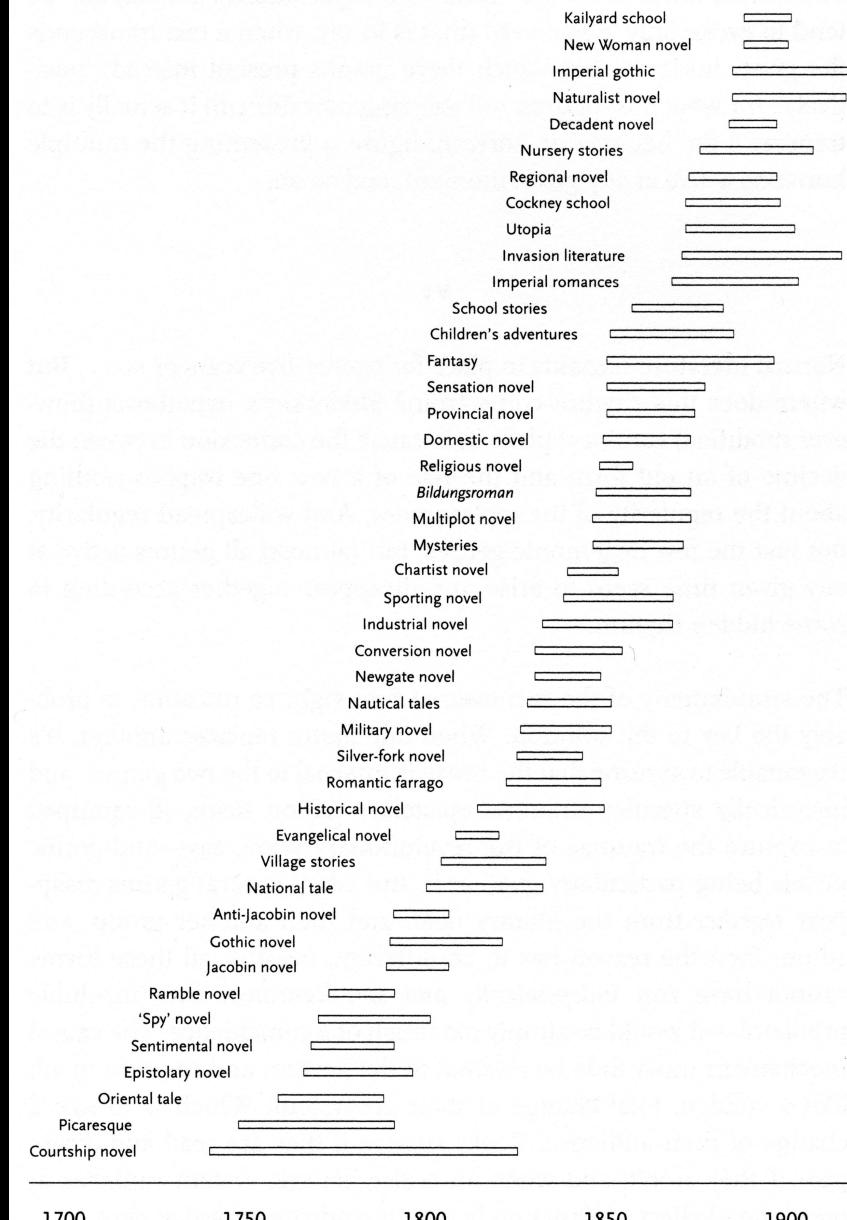


FIGURE 9: British novelistic genres, 1740–1900



For sources, see 'A Note on the Taxonomy of the Forms', page 31.

Maps

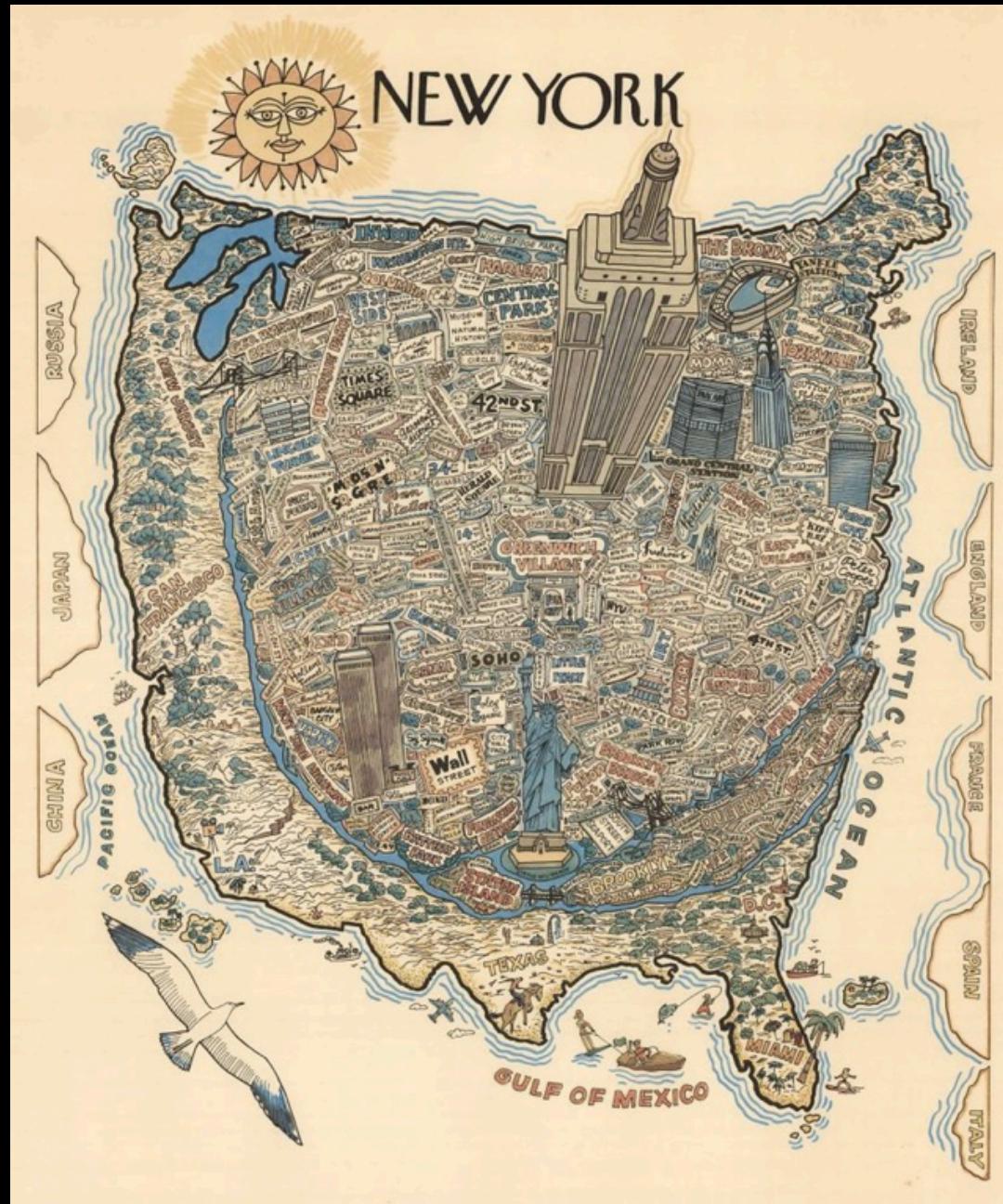
Introduction to Data Visualization

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June 13, 2018

Five Minute Reflection

- What makes a map different from a visualization?



Maps As...

- Referents
 - Event is happening in this place
 - Proxy for spatial categories
- Containers
 - Map boundaries are essential to the visualization
- Spatial Analysis
 - New findings by combining spatial datasets

Maps to represent...

- People
 - Places
 - Things
 - Events
-
- ... All against a backdrop of space/location

BUT...

Critical Cartography

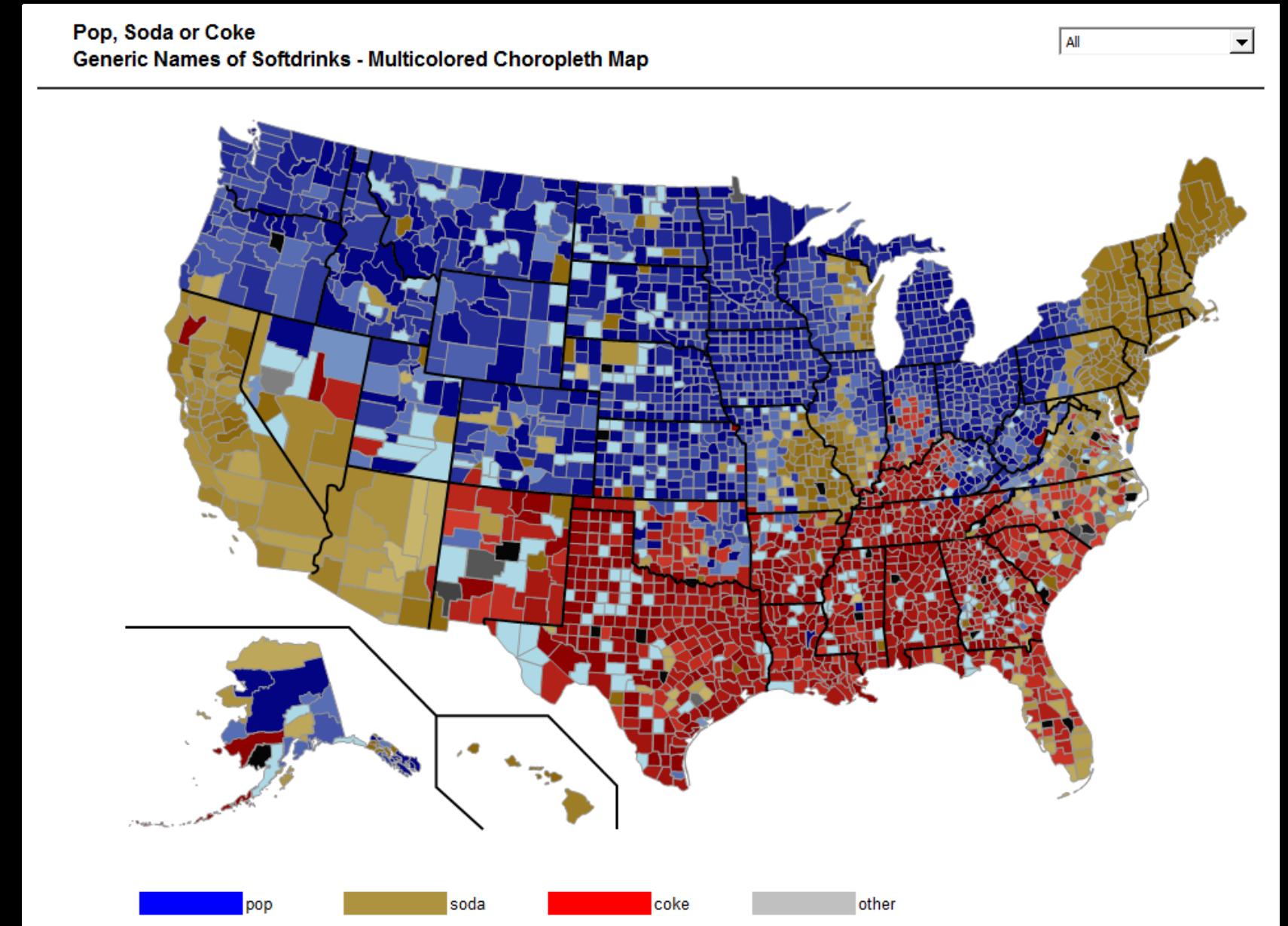
- Gods Eye View
- Supremacy of “science”
- The map (or any visualization) is not always the “truth”...
- Incompatible stories aren’t always wrong

Referents

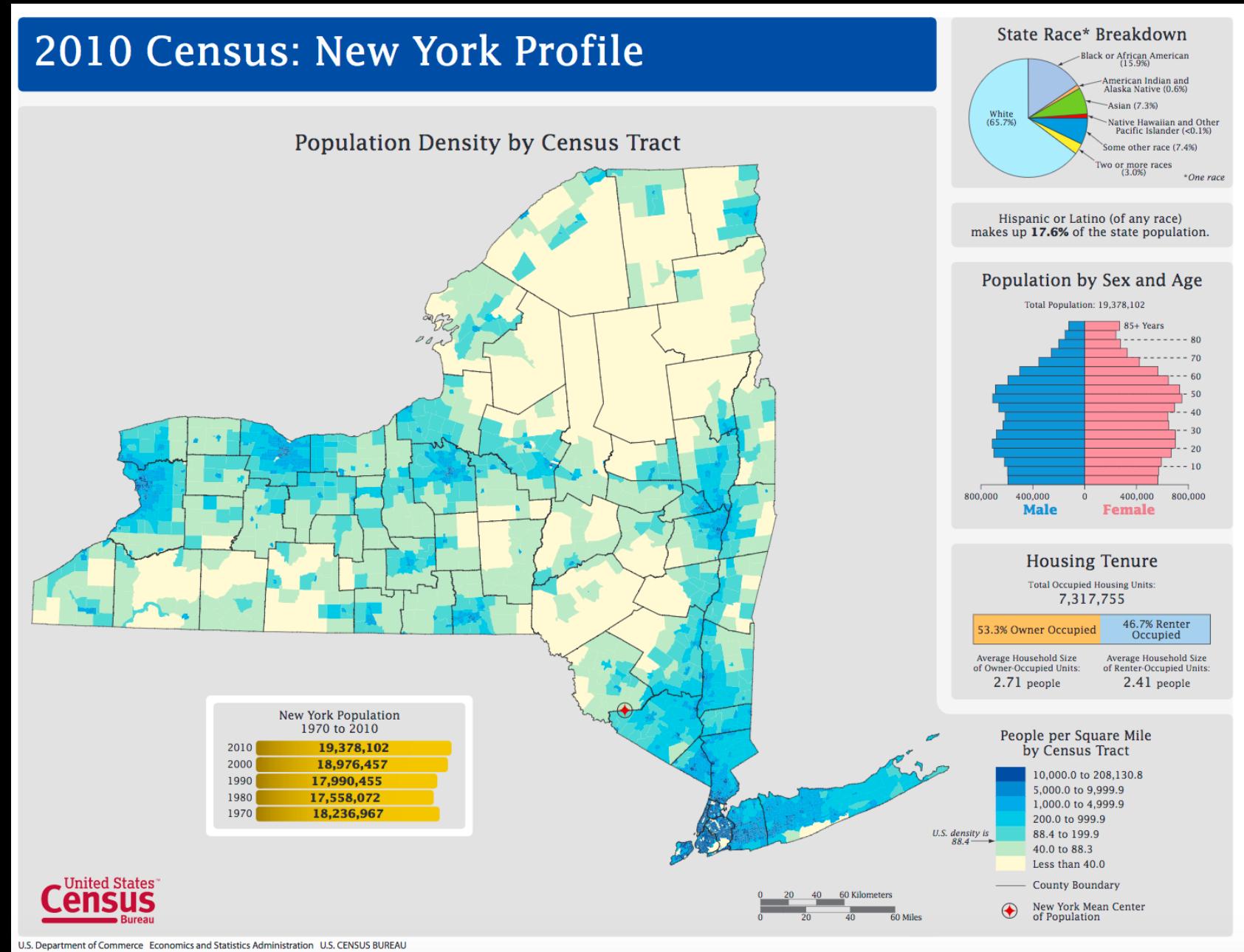
- Stacked Bar Chart
 - www.lucify.com/the-flow-towards-europe/
- Graduated Symbols
 - www.therefugeeproject.org/#/2016
- Wind Map
 - hint.fm/wind



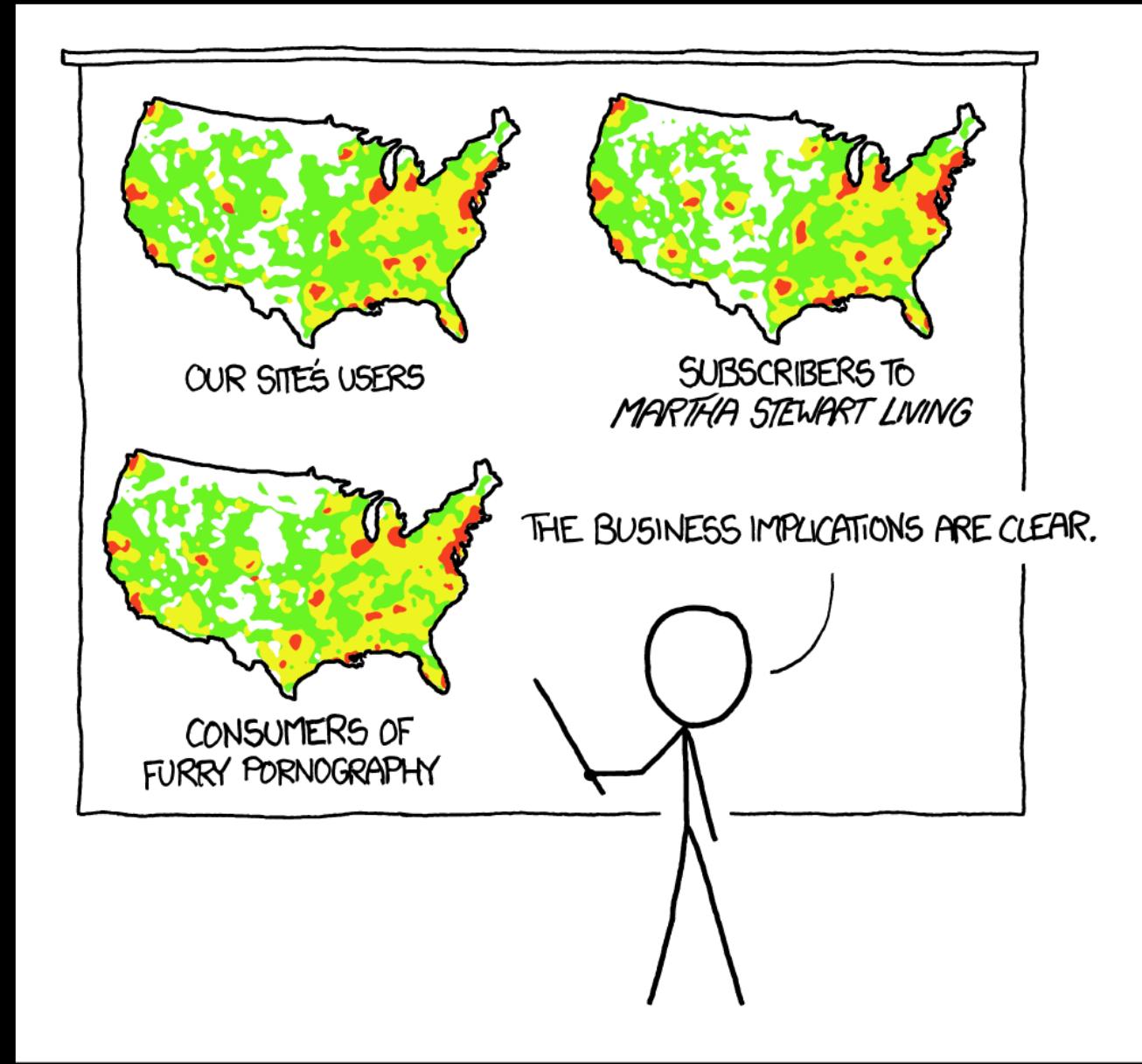
Containers: Categorical Chloropleth



Containers: Numerical Chloropleth



Traps in Normalization & Causation vs. Correlation



PET PEEVE #208:
GEOGRAPHIC PROFILE MAPS WHICH ARE
BASICALLY JUST POPULATION MAPS

Chloropleth & Small Multiples

- <https://www.nytimes.com/interactive/2017/08/07/upshot/music-fandom-maps.html?mcubz=3>

Spatial Analysis

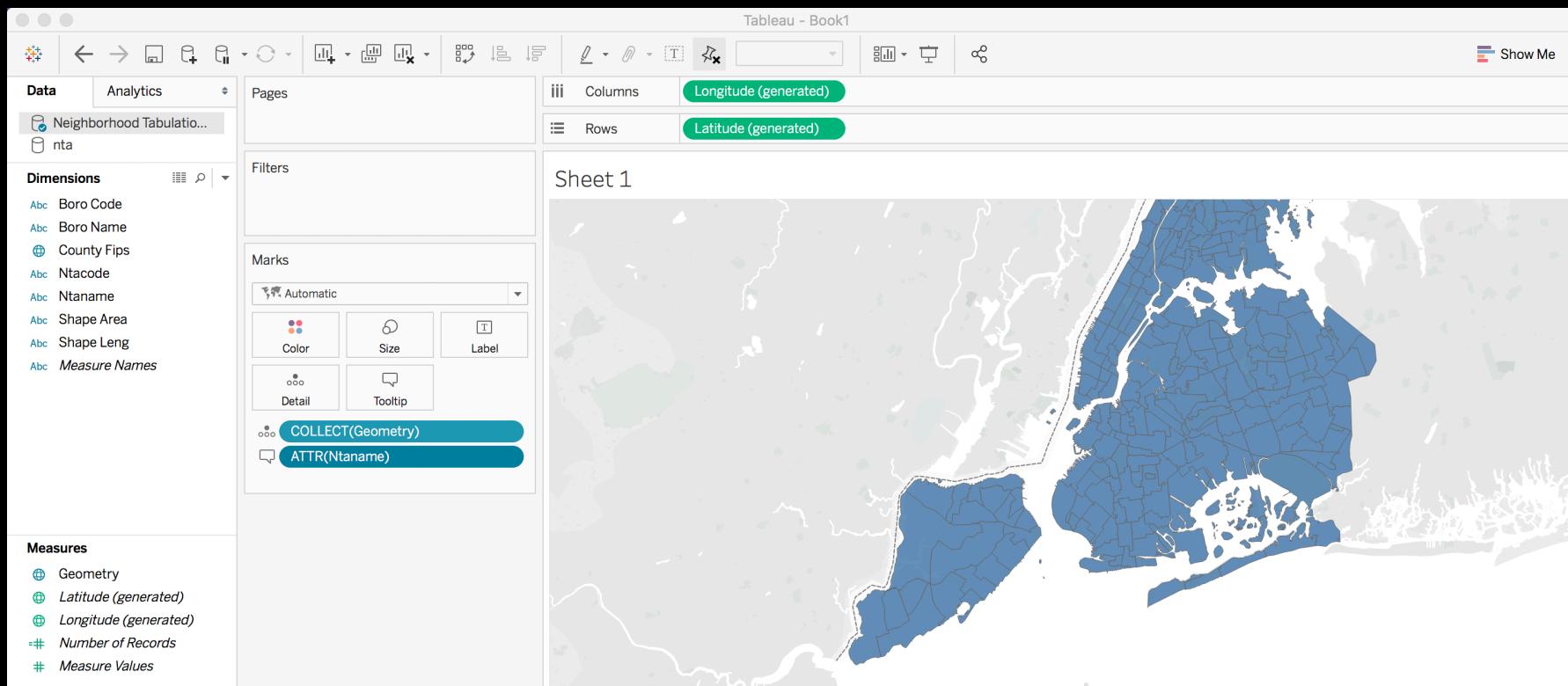
www.subwaylanguages.
michelleajohnson.com

<http://tubecreature.com/#metric=tongues&year=2015&layers=TTTTTF&zoom=13&lon=-0.1500&lat=51.5200>



Adding Shape Files

- <https://data.cityofnewyork.us/City-Government/Neighborhood-Tabulation-Areas/cpf4-rkhq>
- Geojson or KML are easiest (can use ESRI or MapInfo)



Advanced Visualization Techniques & Considerations

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Five minute reflection

- Mapping Activity - Solnit

Plots + Context = Data
Visualization

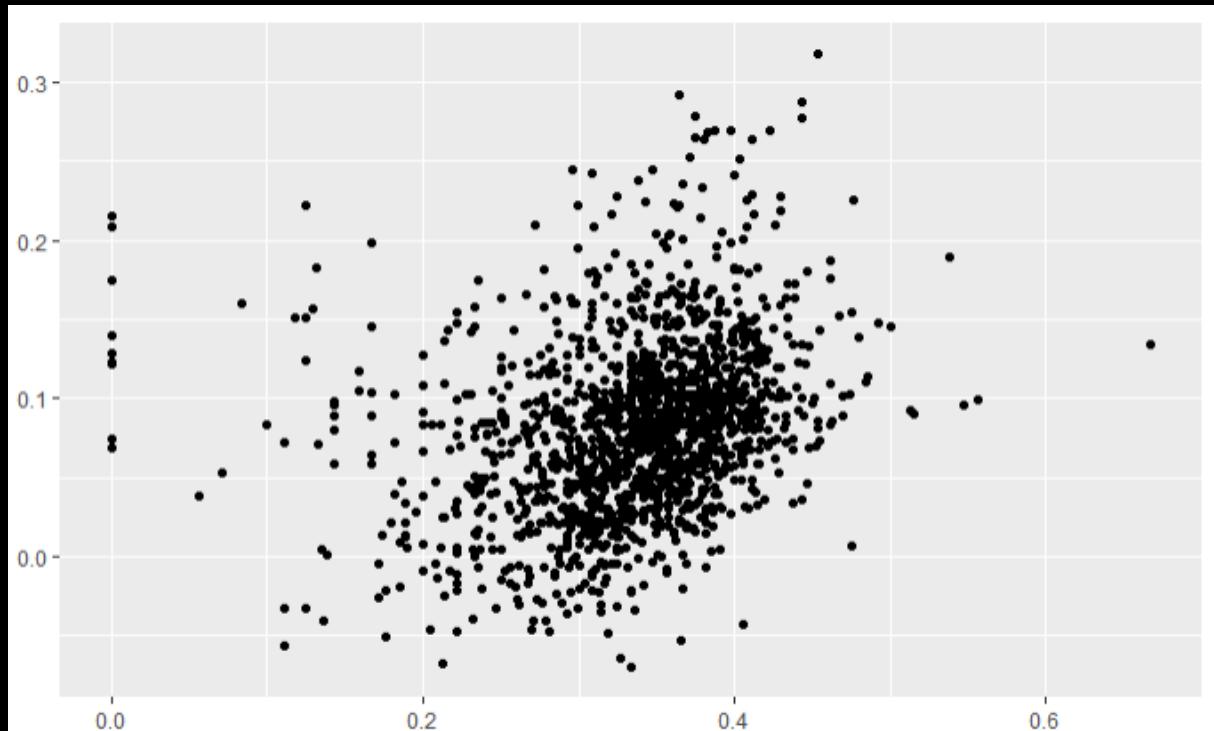
Tufte's Principles

- Labels – if more is needed, write an explanation
- Standardize and normalize units (including money over time)
- Variable dimensions should reflect data dimensions
- Context is essential

Tableau Manages these:

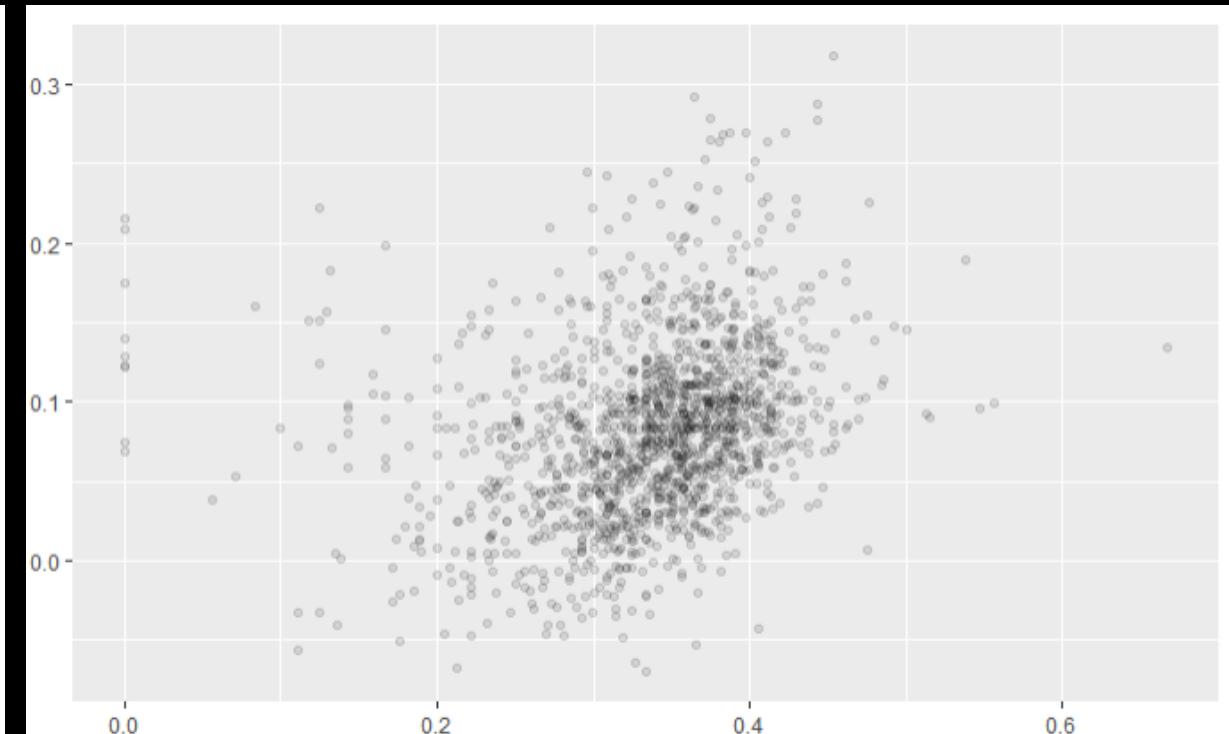
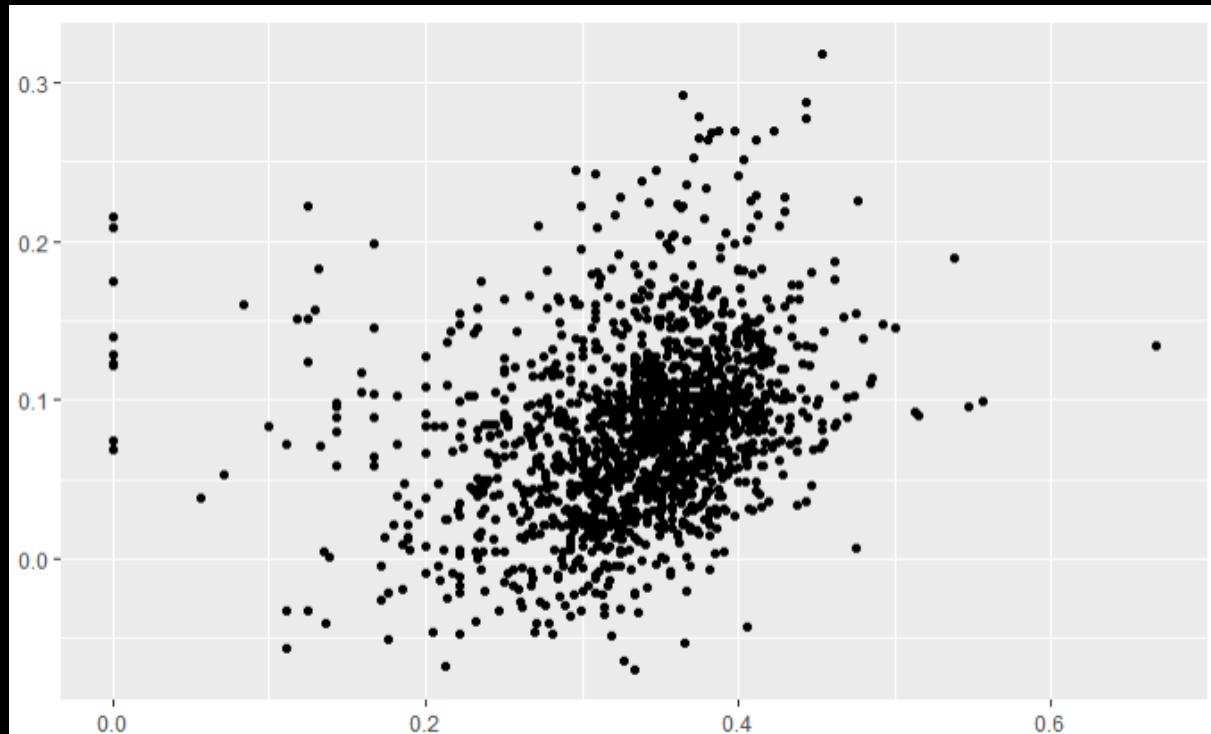
- Keep the design of the plot consistent
- Numerical proportions should be accurately represented by visual

OVERPLOTTING: Point Density

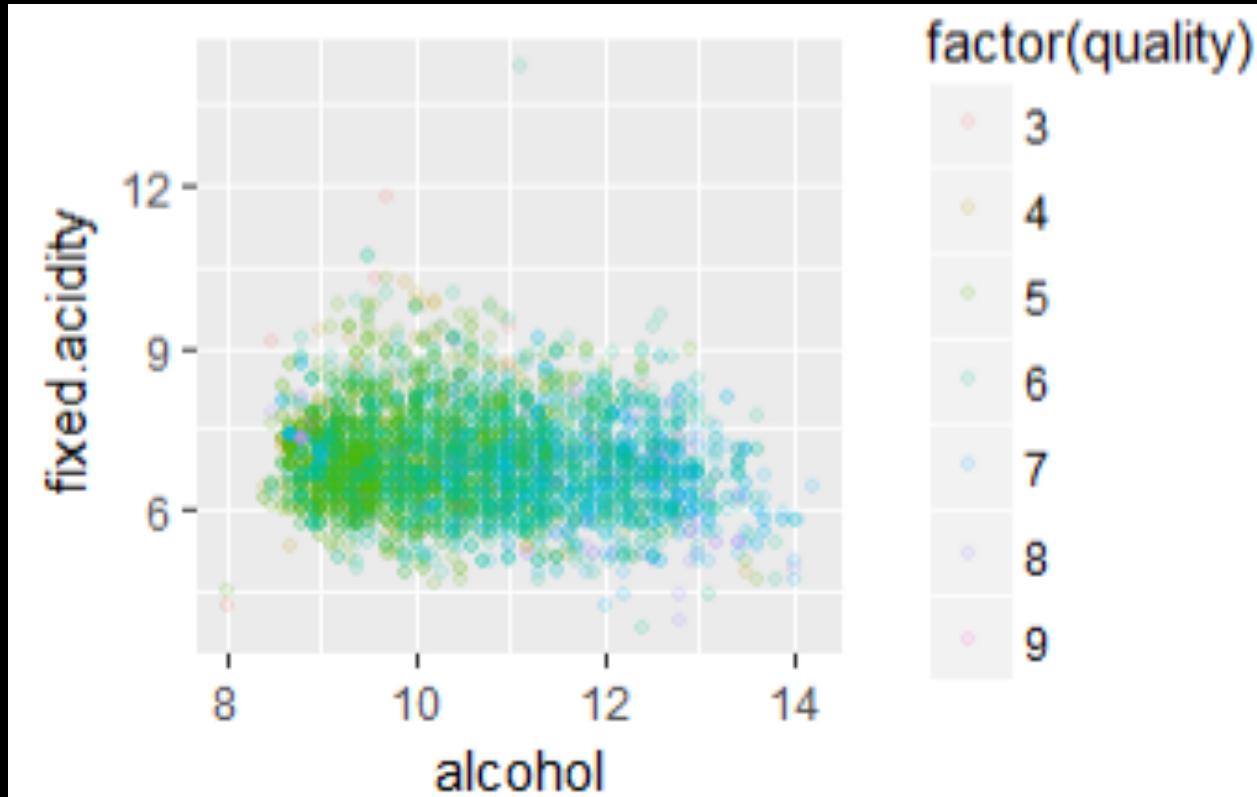


OVERPLOTTING: A SOLUTION

Transparency

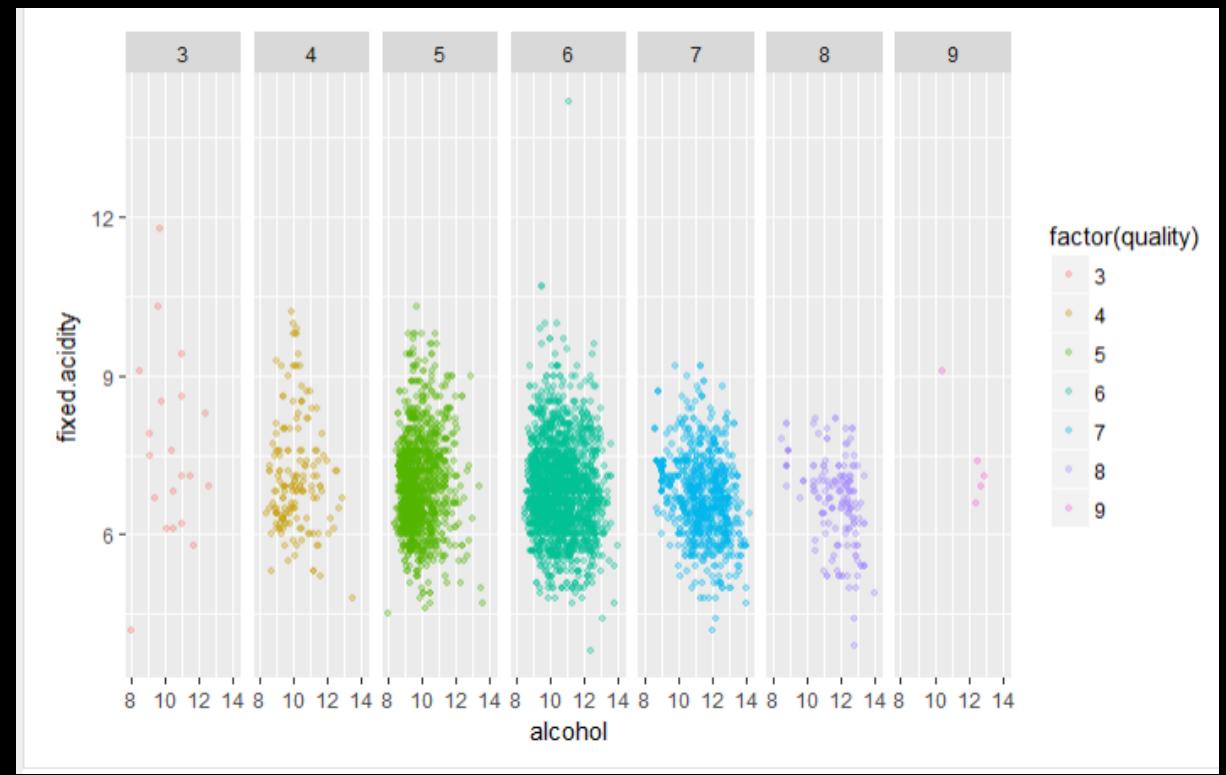
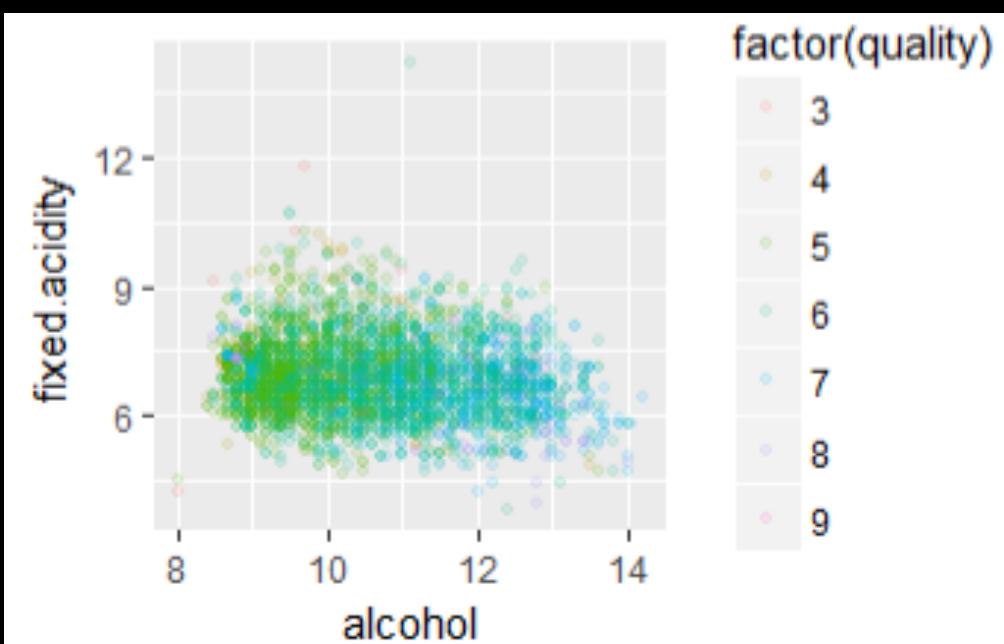


OVERPLOTTING: 3 or more Variables



OVERPLOTTING: A SOLUTION

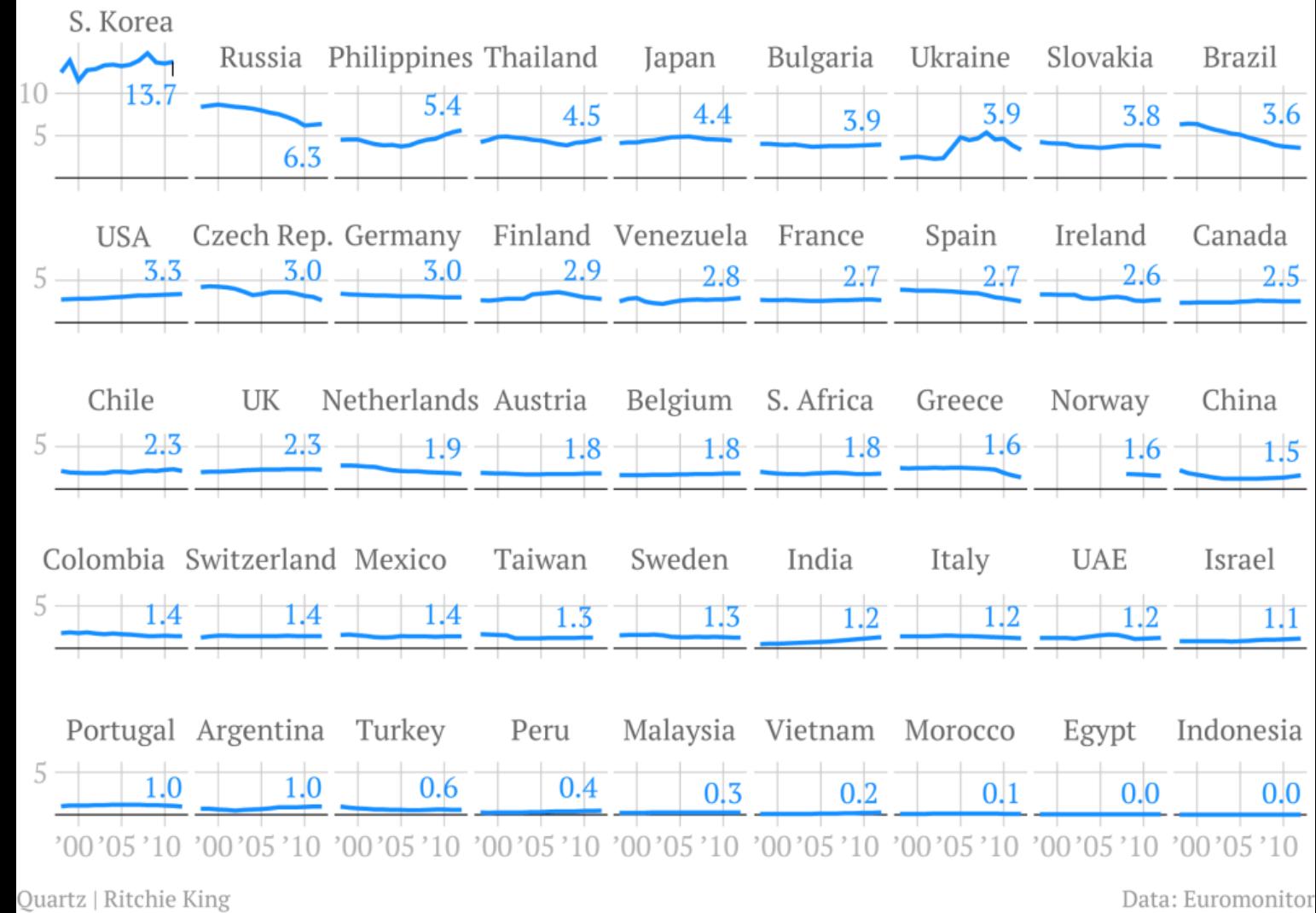
Small Multiples



Small Multiples

The average amount of liquor consumed by a person of drinking age

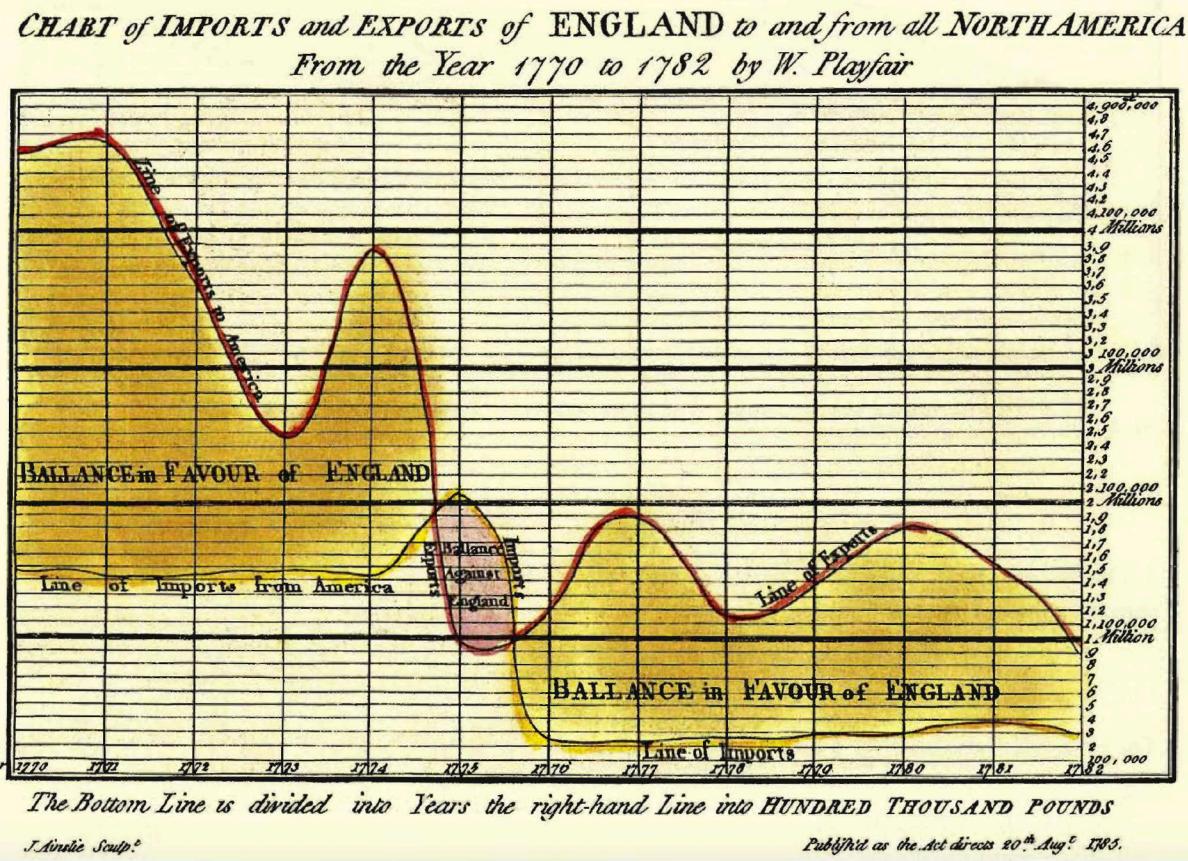
Shots per week of any spirit



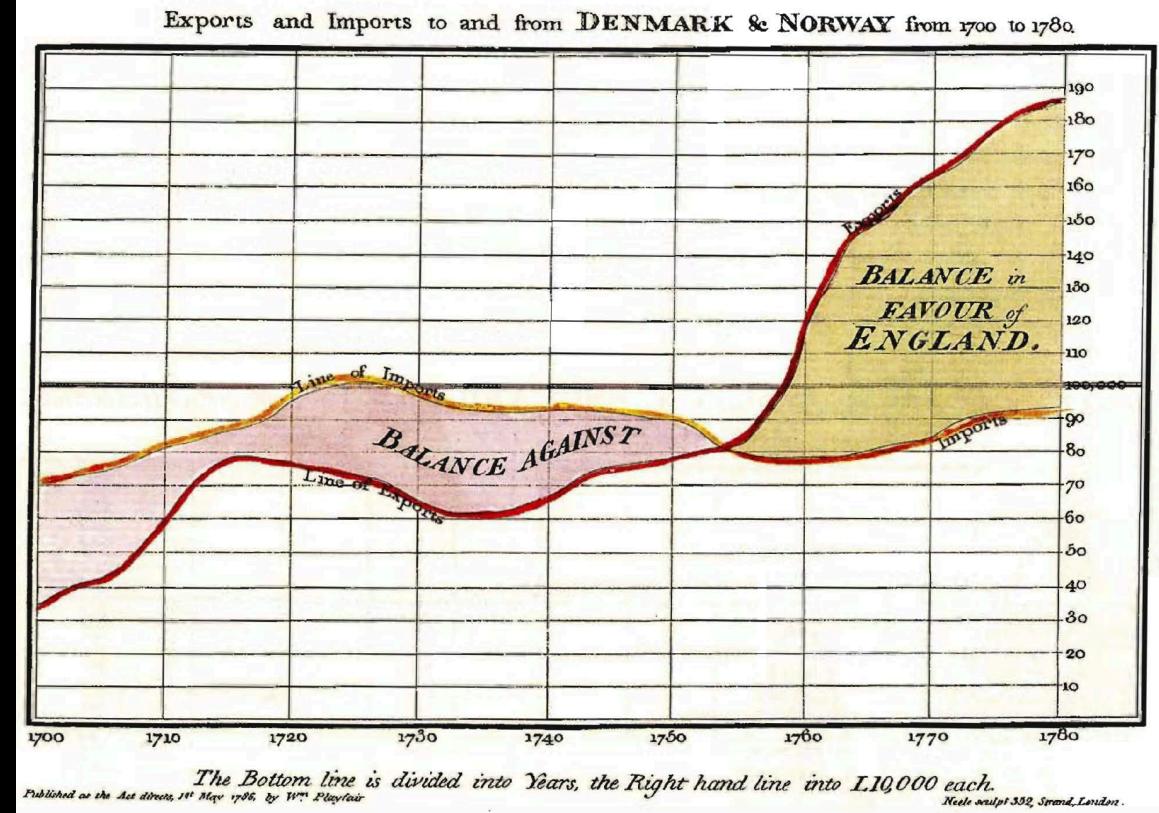
Small Multiples with Tableau

- <https://public.tableau.com/profile/beatriz.woods#/vizhome/PresidentialElectionResults-smallmultiples/Smallmultiples>
- <https://public.tableau.com/s/blog/2016/07/finding-small-stories-ncaa-football-data>

Making Polished Graphics



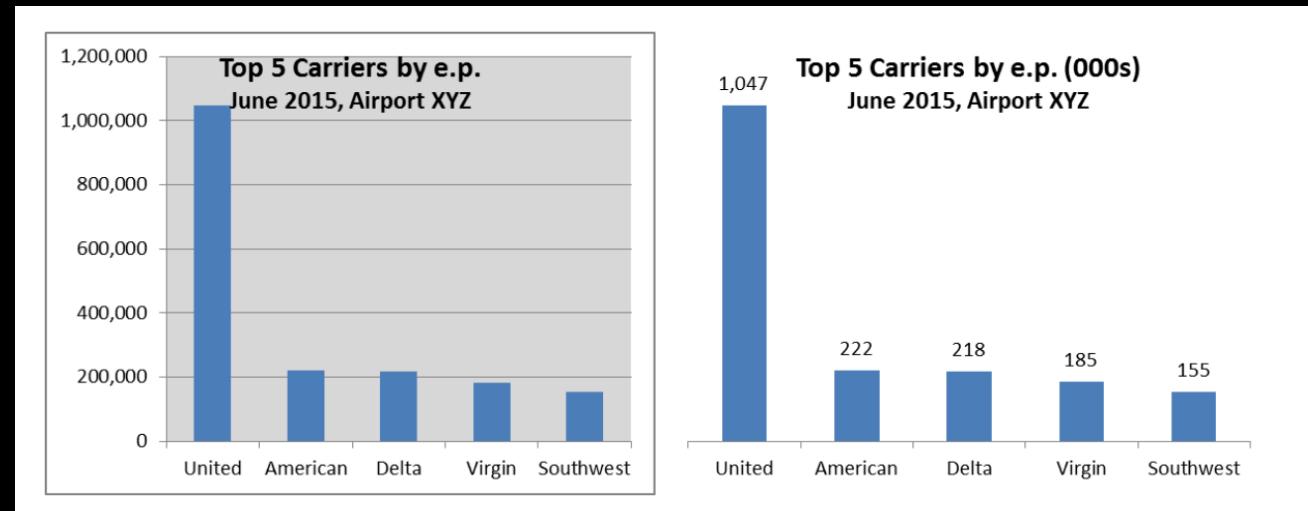
Playfair 1785



Playfair 1876

Polish: Simplification

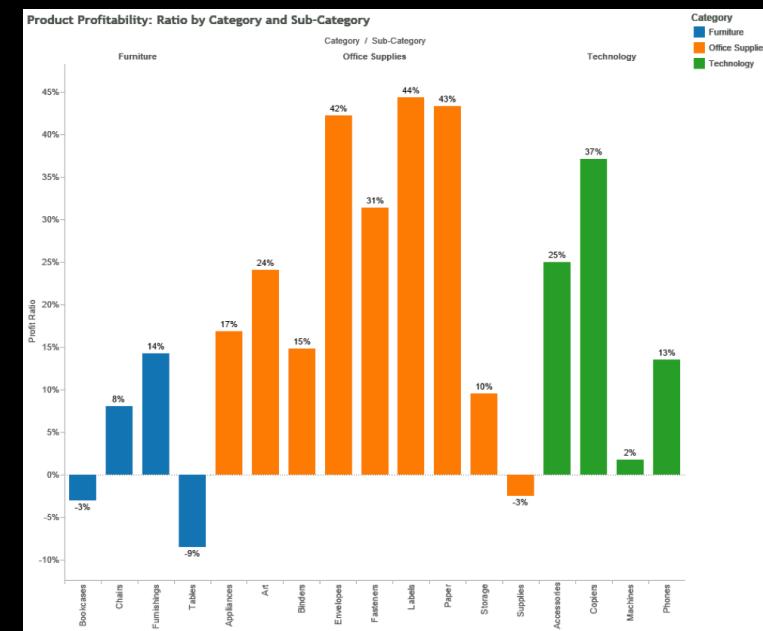
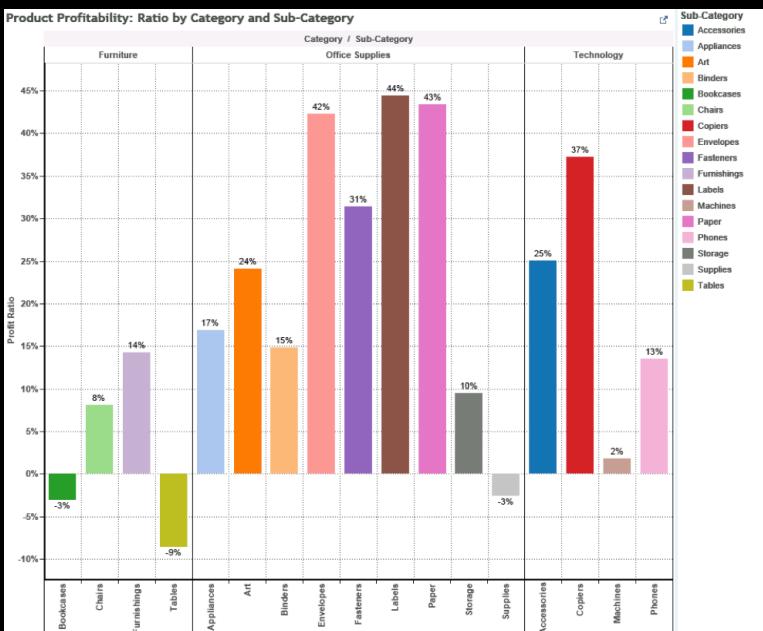
- The data : ink ratio
 - Minimize grids & tick marks
 - Simplify axes
 - Remove all non-essential lines
 - Minimize redundancy
 - Labels are data



<https://dwuconsulting.com/tools/articles/prepare-effective-dashboard>

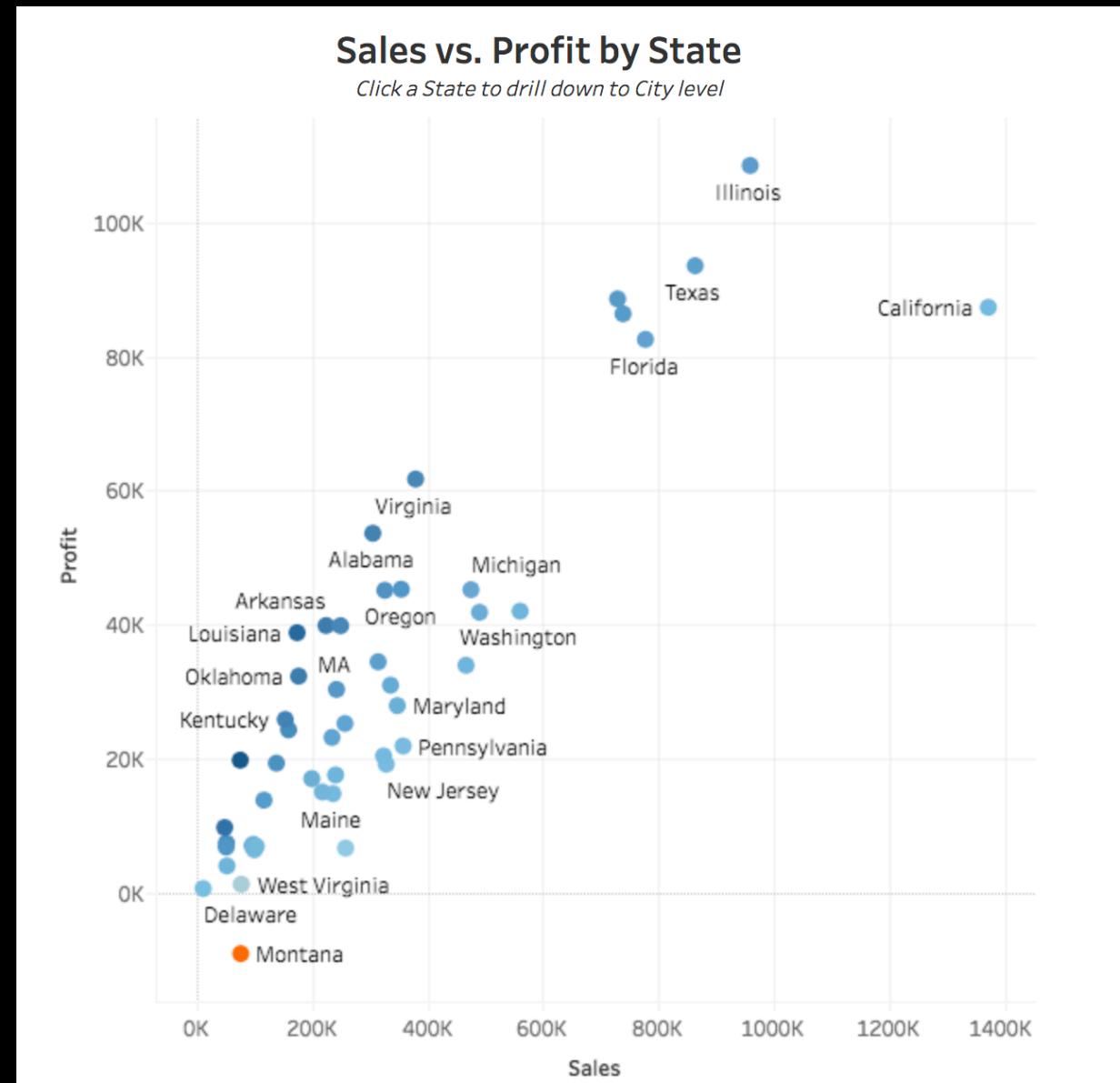
Polish: ChartJunk

- No 3D.
- Patterns should be used VERY carefully if at all
- If gridlines are necessary, make them light
- Plots on plots cannot be read



Polish: Redundancy

- If the information can be recovered elsewhere, remove it
 - Titles
 - Legends
 - Labels
- If it's not obvious: add it



But it's controversial

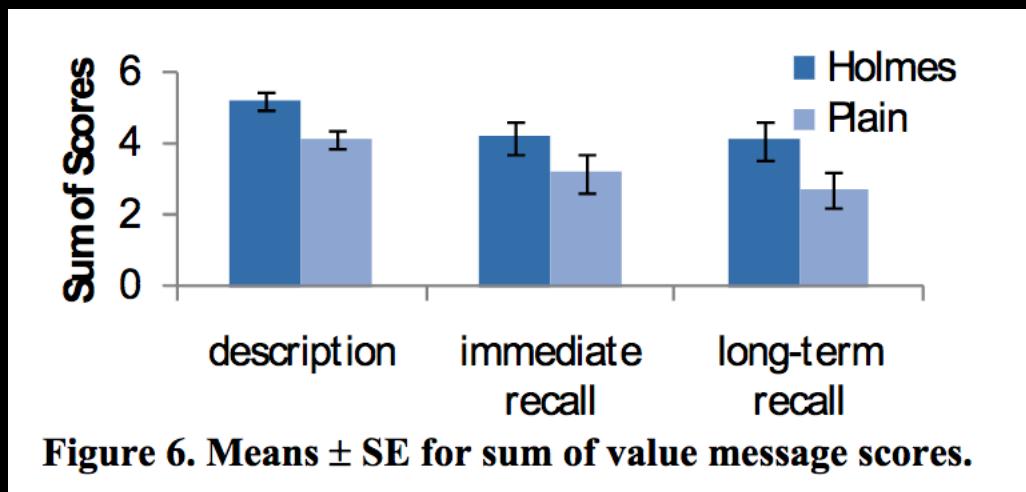


Figure 6. Means \pm SE for sum of value message scores.

Bateman, 2010

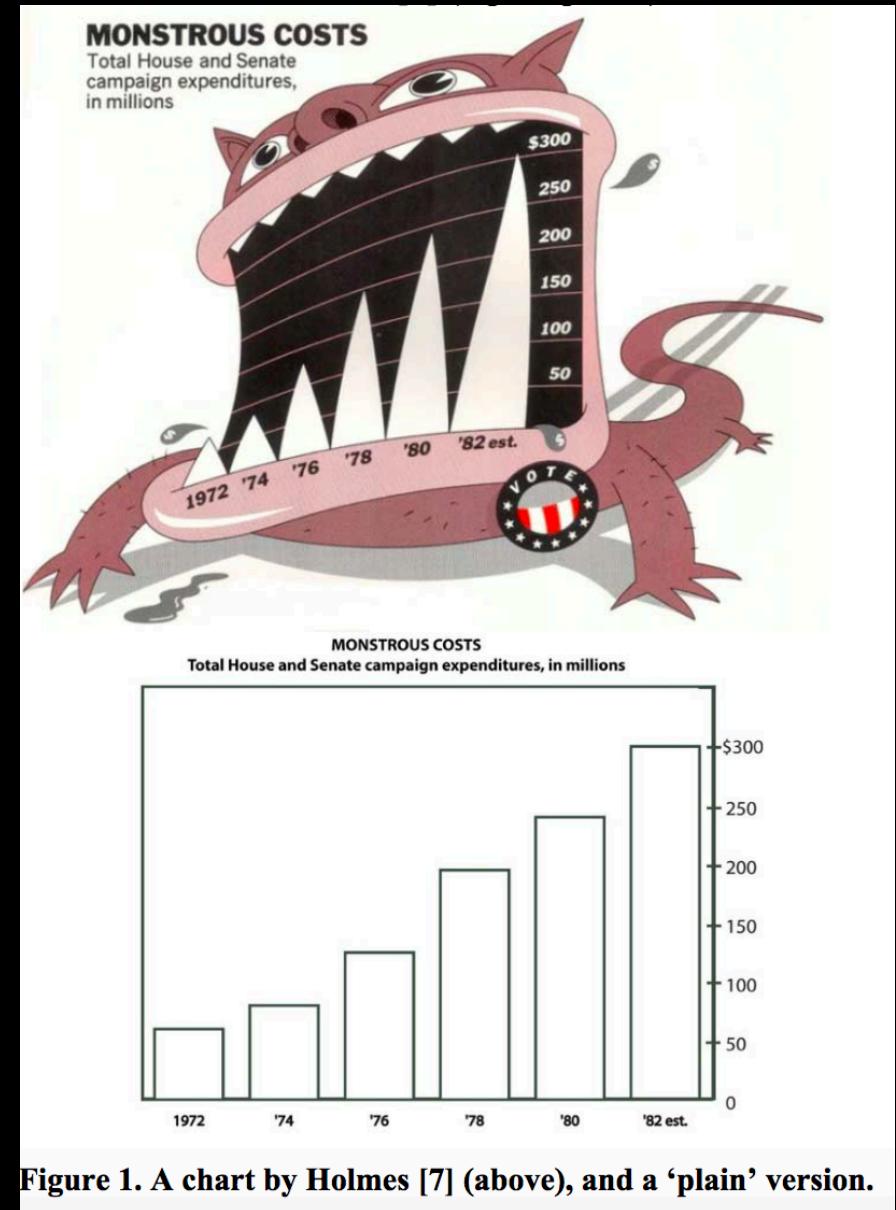


Figure 1. A chart by Holmes [7] (above), and a 'plain' version.