Western

UNIVERSITY · CANADA

InfoViz & VA

for Effective Communication in Data Science

Arman Didandeh

February 25, 2016

Lab @ Western

Visualization

- Combine and integrate visual marks into more complex structural forms to encode information

Visualization

- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz

Visualization

- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz
- But why?

This report details the number of West Nile Virus human cases in Ontario from January 2012 to November 2014. In January 2012 there were two human cases, in February there were three cases, in March, there were five cases, in April there were seven cases, in May there were nine cases, in June there were eleven cases, in July there were thirteen cases, in August there were fifteen cases, in September there were seventeen cases, in October there were nineteen cases, in November, there were twenty-one cases, in December there were twenty-three cases. In January 2013, there were forty cases, in February there were forty-two cases, in March there were thirty-eight cases, in April, there were thirty-four cases, in May there were thirty cases, in June there were twenty-six cases, in July there were twenty-two cases, in August there were twenty cases. In September of 2013, there were twenty cases, in October there were twenty cases, in November there were twenty-two cases, in December there were twenty-three cases. In January of 2014, there were twenty-four cases, in February there were twenty-five cases, in March there were twenty-seven cases, and in April there were thirty cases. In May there were thirty-five cases and in June there were fourty new human cases.

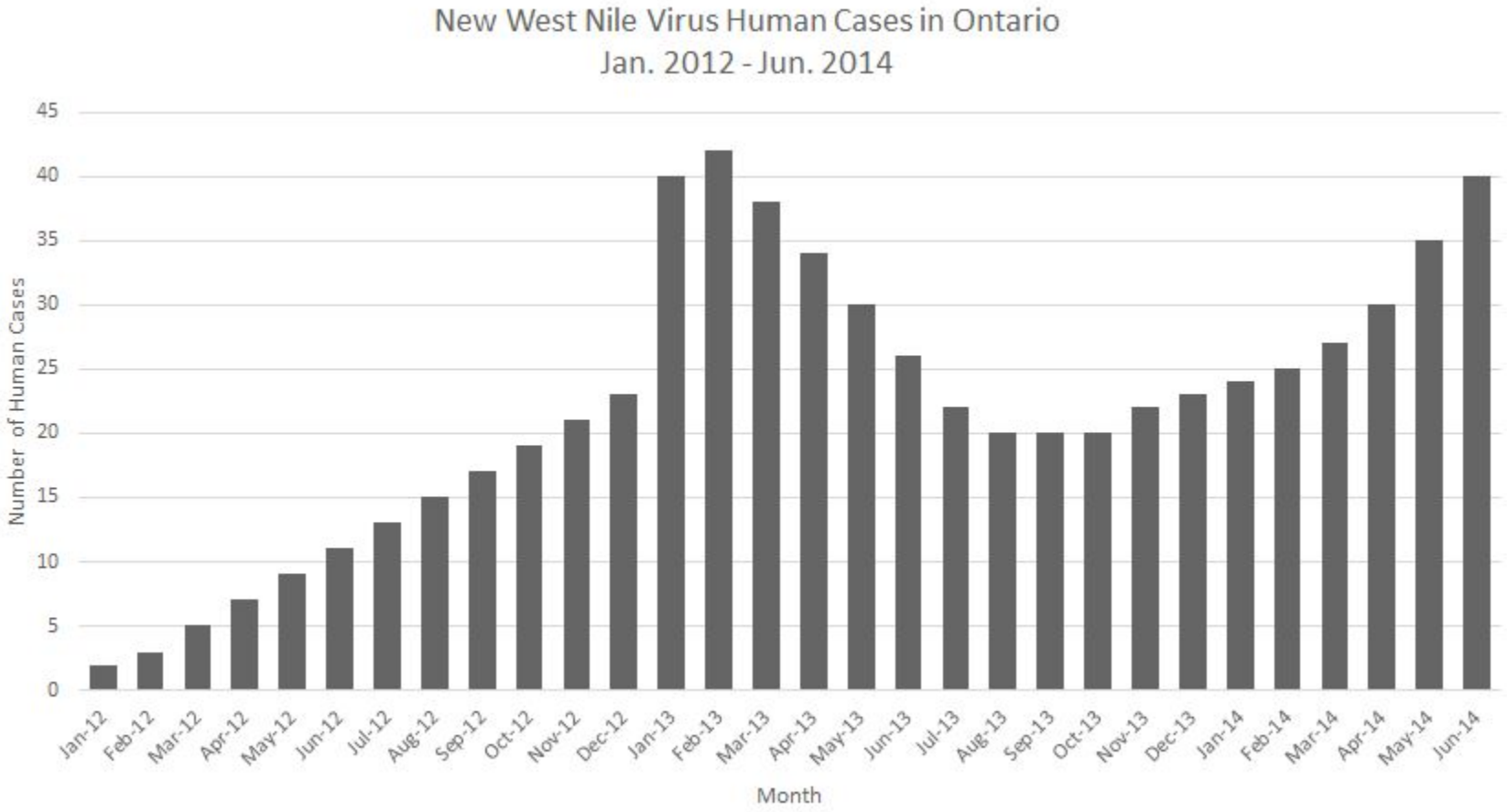
What do we know about this text?

Western

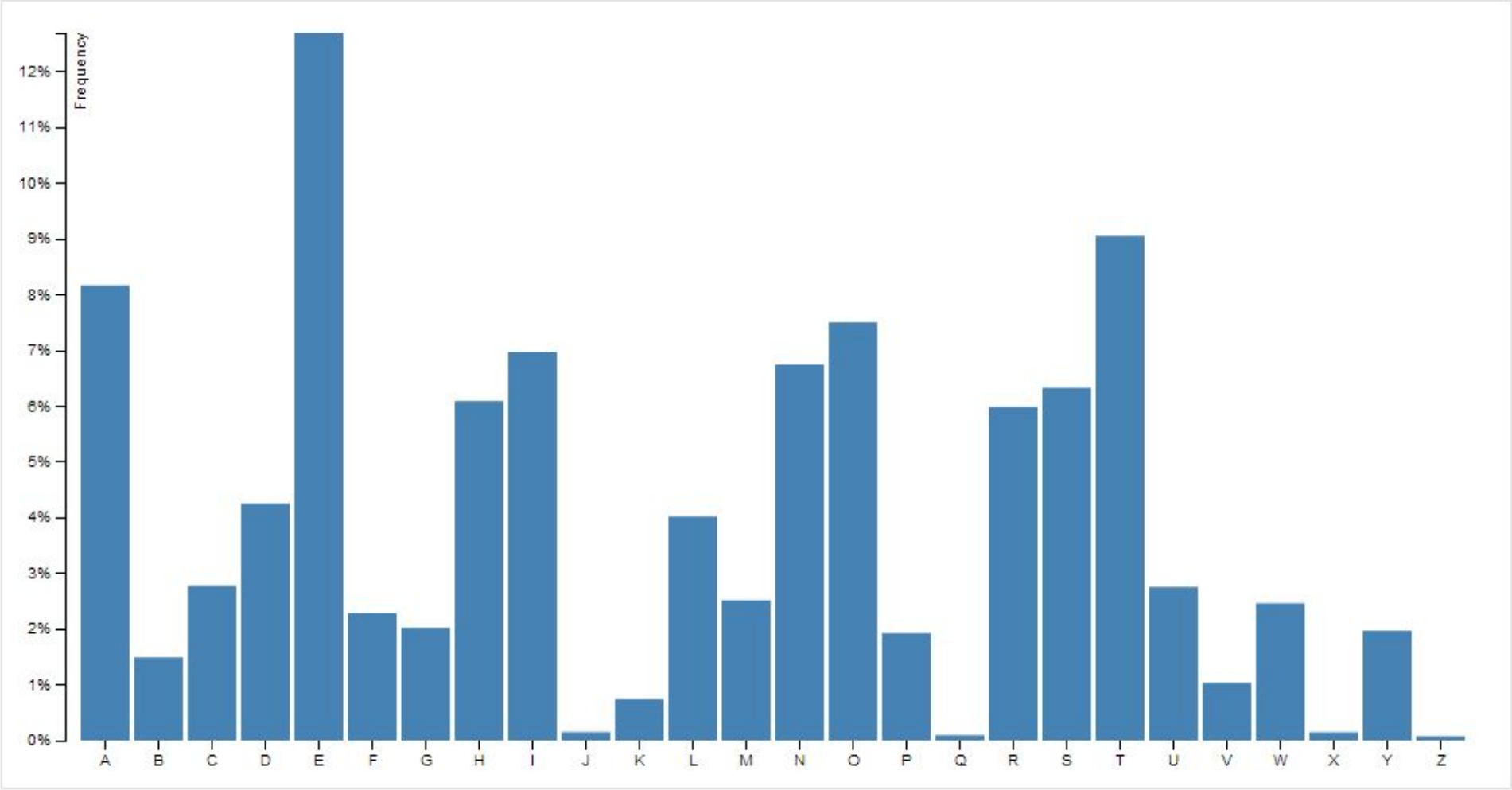
Month	Number of West Nile Virus Human Cases
Oct 12	19
Nov 12	21
Dec 12	23
Jan 13	40
Feb 13	42
Mar 13	38
Apr 13	34
May 13	30
Jun 13	26
Jul 13	22
Aug 13	20
Sep 13	20
Nov 13	22
Dec 13	23

What did we see in this table?

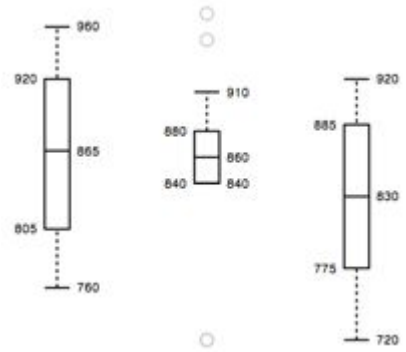
Western

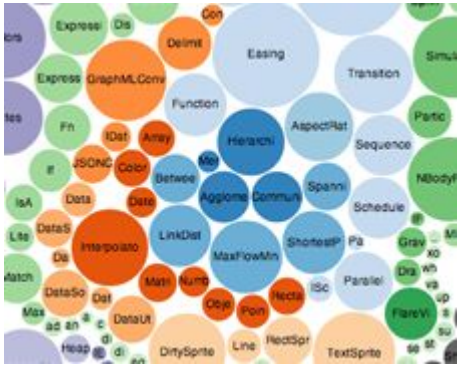

New West Nile Virus Human Cases in Ontario
Jan. 2012 - Jun. 2014
Number of Human Cases
0
5
10
15
20
25
30
35
40
45
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Jul-12
Aug-12
Sep-12
Oct-12
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Month

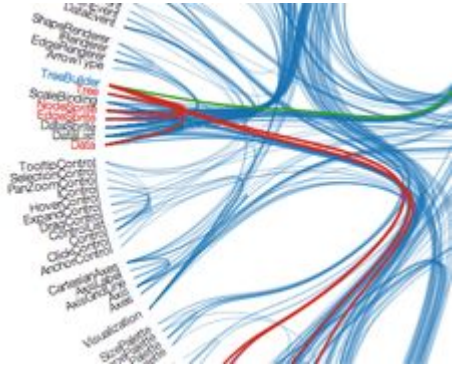
Visualization



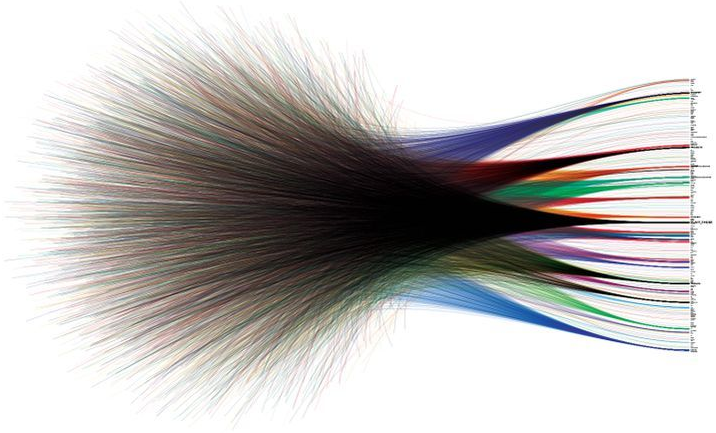
Visualization

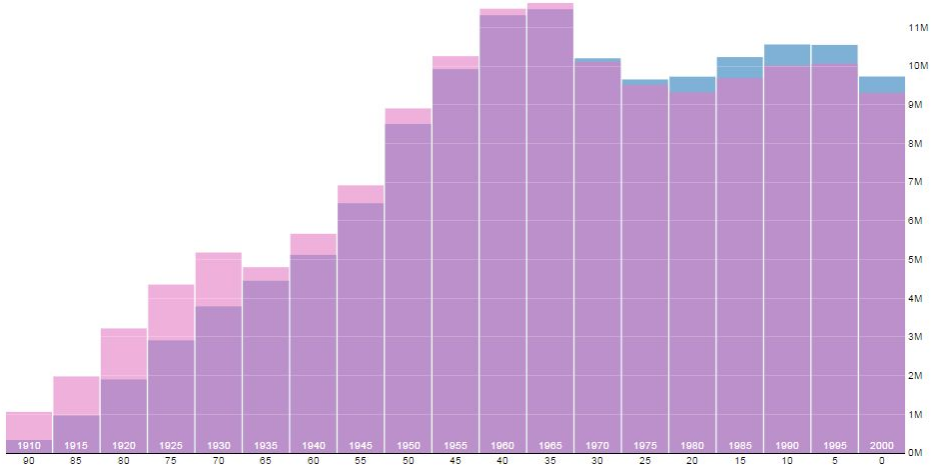






Visualization





Visualization

- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz
- But why?
- Different types of visualizations are fit for different tasks

Visualization

- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz
- But why?
- Different types of visualizations are fit for different tasks:
  - illustrate relationships
  - discover trends, patterns, and outliers
  - get attention of recipients
  - support remembering and recall
  - facilitate learning
  - tell a story

Visualization

- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz
- But why?
- Different types of visualizations are fit for different tasks
- Relate to and depend upon other disciplines, such as human perception, cognition theory, computer science, etc.

Visualization

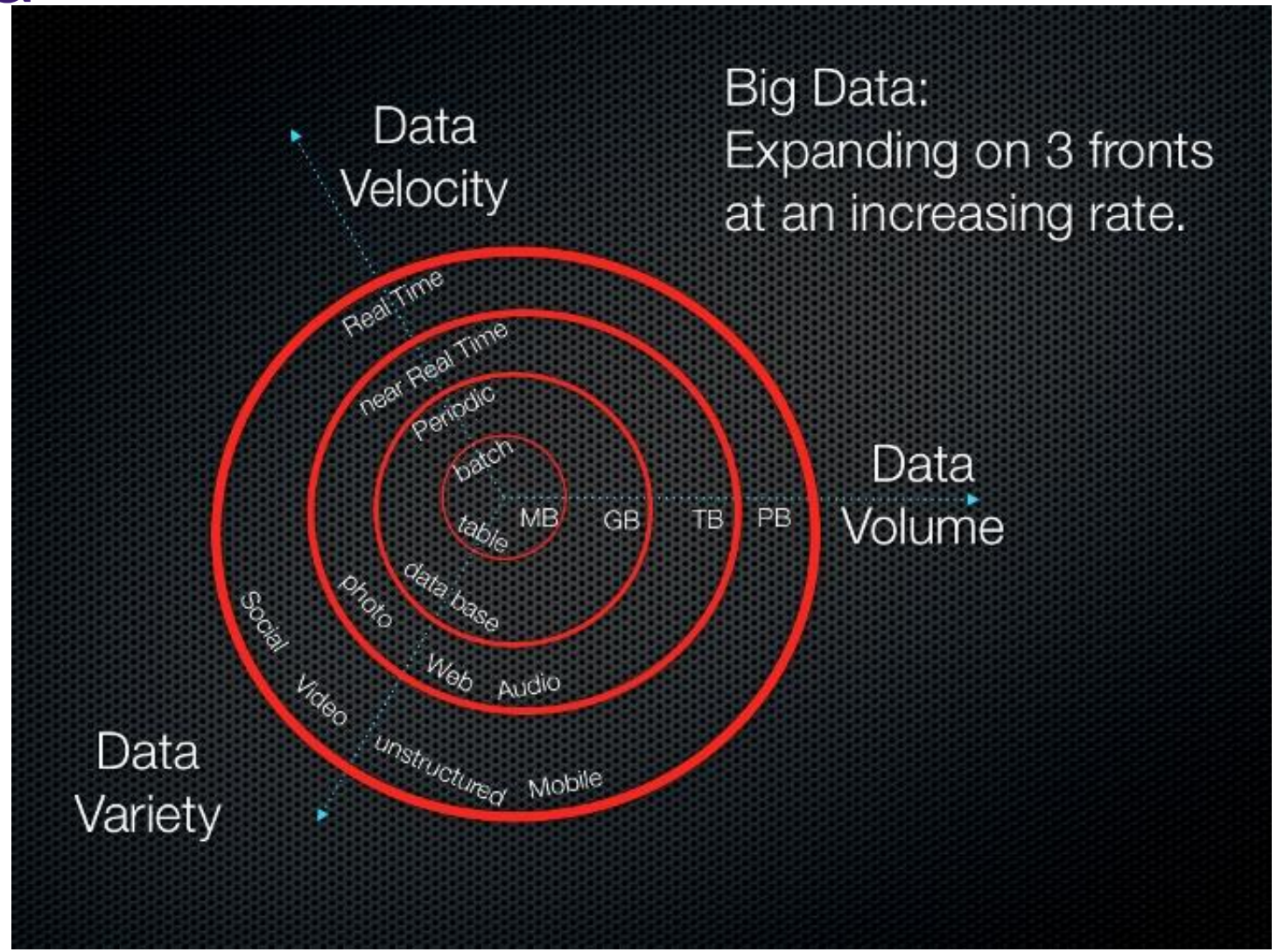
- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz
- But why?
- Different types of visualizations are fit for different tasks
- Relate to and depend upon other disciplines, such as human perception, cognition theory, computer science, etc.
- Need interaction to be more effective

Visualization

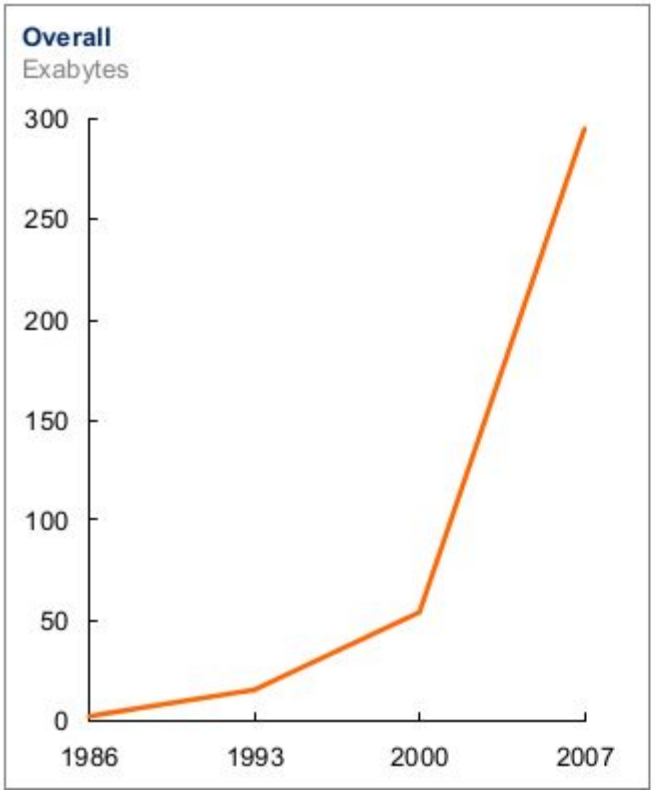
- Combine and integrate visual marks into more complex structural forms to encode information
- Hence, Information Visualization, i.e., InfoViz
- But why?
- Different types of visualizations are fit for different tasks
- Relate to and depend upon other disciplines, such as human perception, cognition theory, computer science, etc.
- Need interaction to be more effective:
  - InfoViz.org
  - Force-Directed Graph
  - Sunburst Partition
  - Hierarchical Edge Bundling
  - US Map + Voronoi
  - Scatterplot Matrix
  - Treemap

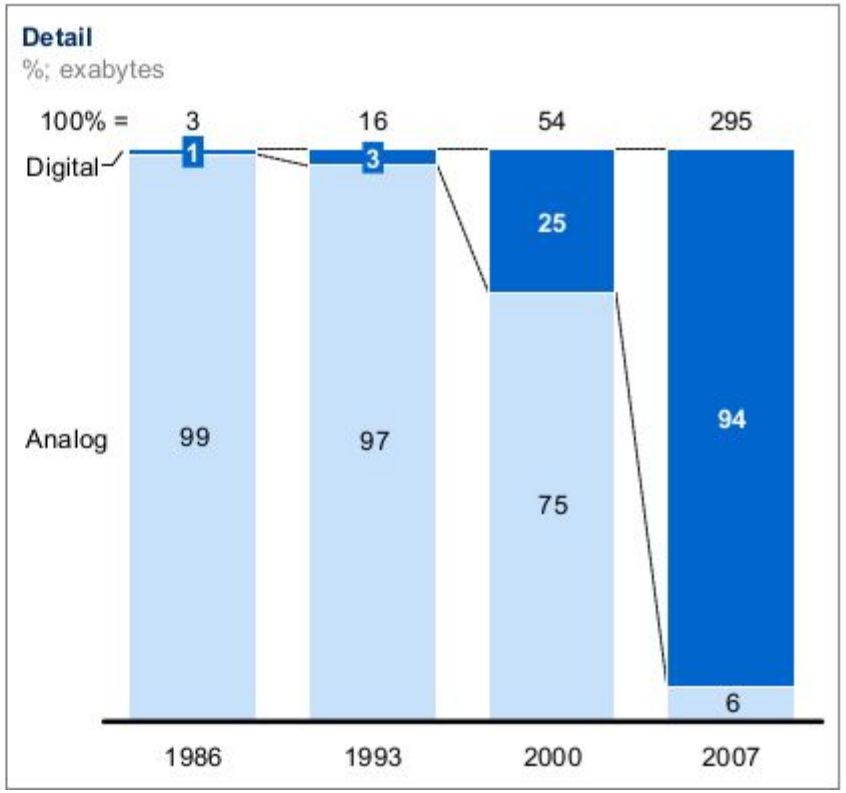
Big Data

Big Data

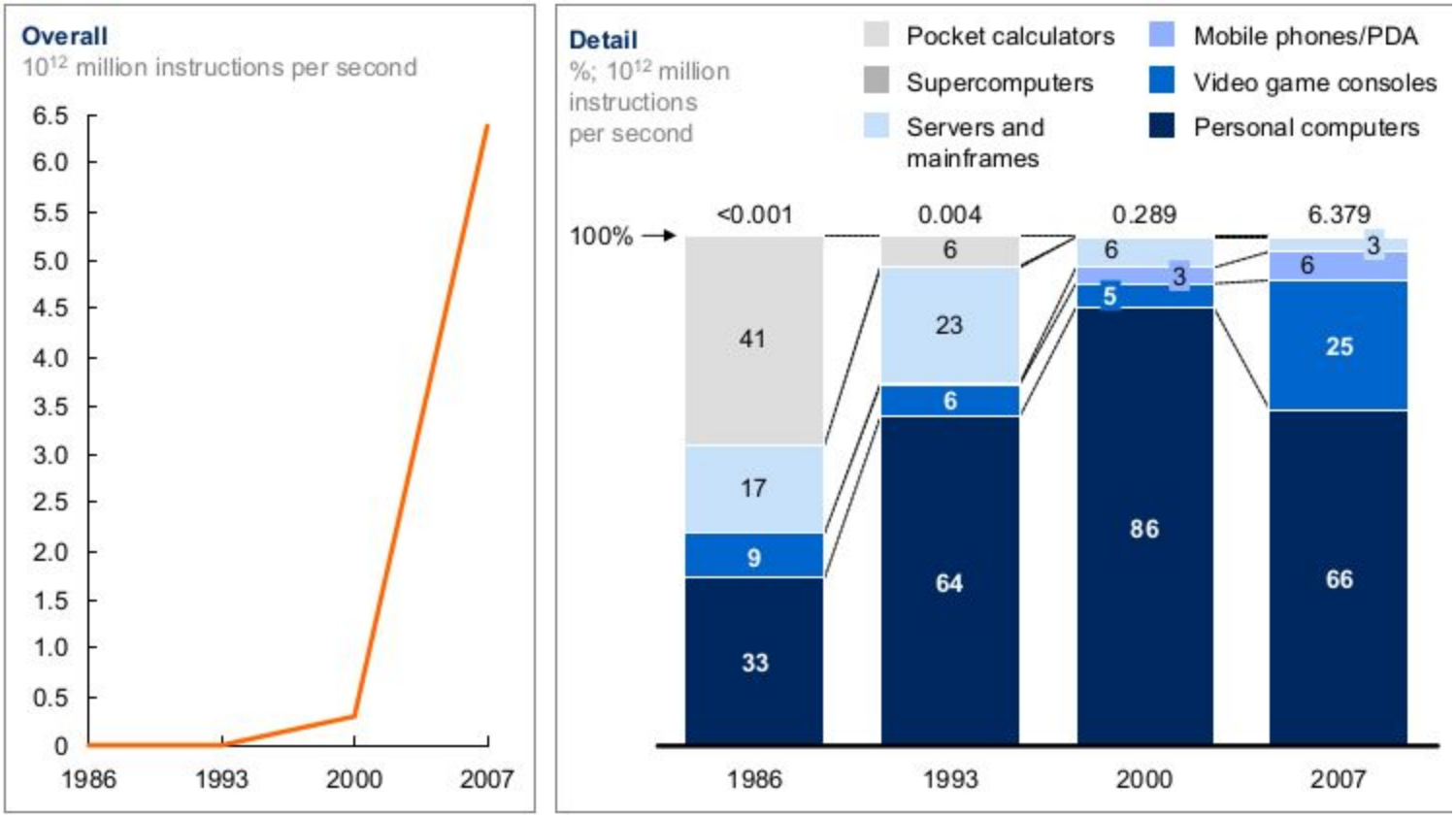

Big Data:
Expanding on 3 fronts
at an increasing rate.
Data
Velocity
Real Time
near Real Time
Periodic
batch
table
MB
GB
TB
PB
Data
Volume
data base
photo
Social
Video
Web
Audio
unstructured
Mobile
Data
Variety

Data Storage

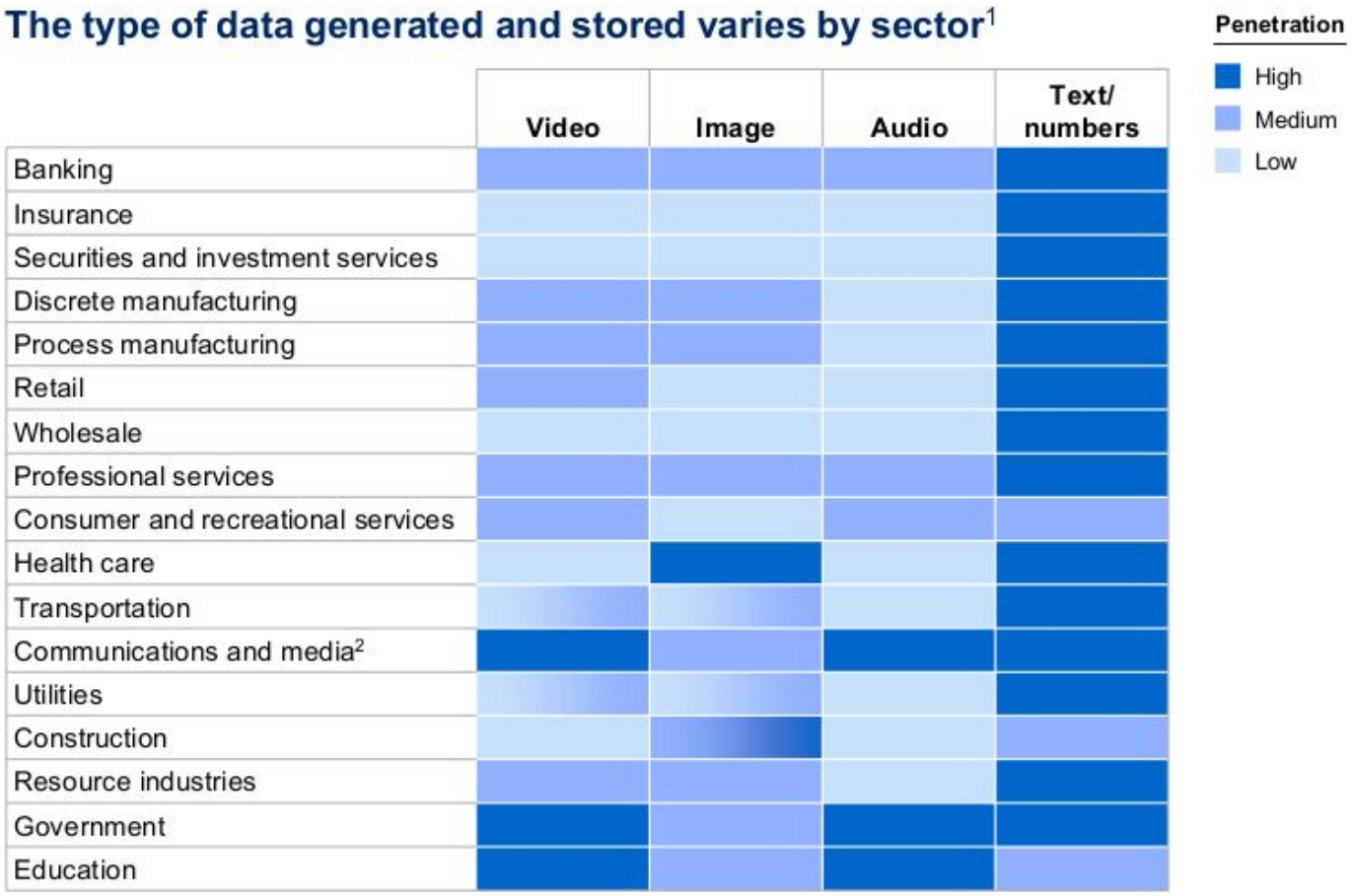




Computational Capacity



Data Availability



Visual Analytics

- Naively: InfoViz + Analytics

Visual Analytics

- Naively: InfoViz + Analytics
- But what is Analytics?

Visual Analytics

- Naively: InfoViz + Analytics
- But what is Analytics?
- No common agreed-upon definition among scholars and practitioners

Visual Analytics

- Naively: InfoViz + Analytics
- But what is Analytics?
- No common agreed-upon definition among scholars and practitioners
- *-ics* denotes "The science and/or art of of studying something" [1]

[1] etymonline.com

Visual Analytics

- Naively: InfoViz + Analytics
- But what is Analytics?
- No common agreed-upon definition among scholars and practitioners
- *-ics* denotes "The science and/or art of of studying something"
- Analytics = "The science and/or art of of studying" the analyses of data in various forms

Visual Analytics

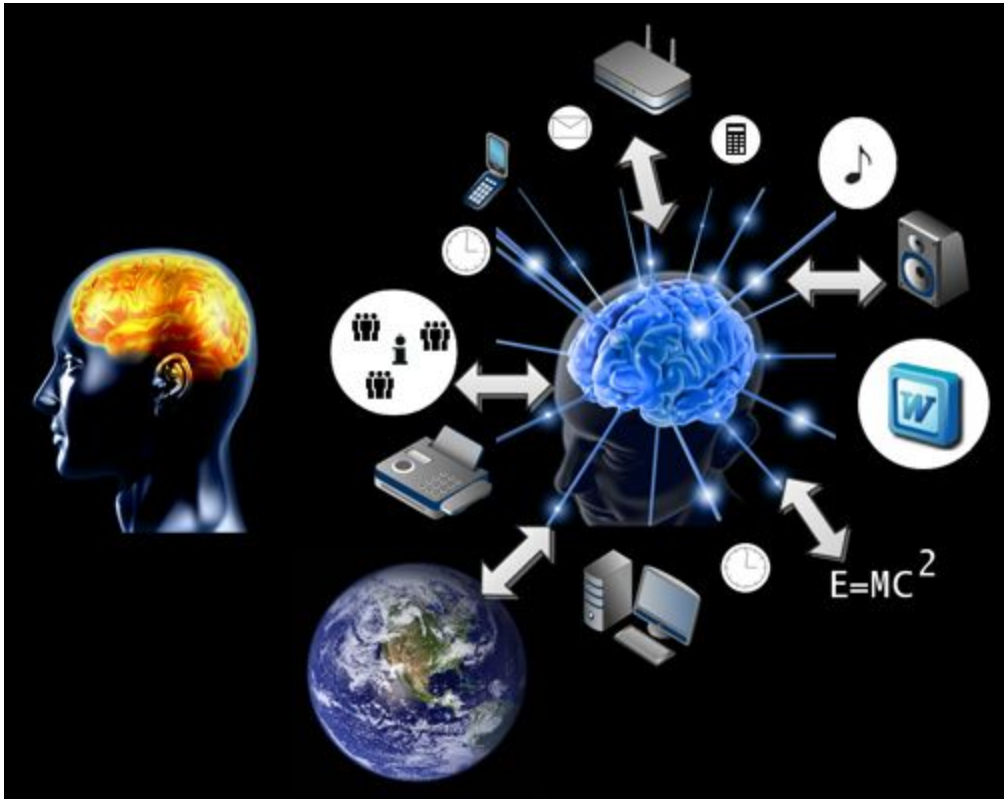
- Naively: InfoViz + Analytics
- But what is Analytics?
- No common agreed-upon definition among scholars and practitioners
- *-ics* denotes "The science and/or art of of studying something"
- Analytics = "The science and/or art of of studying" the analyses of data in various forms
- Remember the "*other disciplines*" point?

Visual Analytics

- Naively: InfoViz + Analytics
- But what is Analytics?
- No common agreed-upon definition among scholars and practitioners
- *-ics* denotes "The science and/or art of of studying something"
- Analytics = "The science and/or art of of studying" the analyses of data in various forms
- Remember the "*other disciplines*" point?
  - Human perception, cognition theory, computer science, etc.

Human Cognition

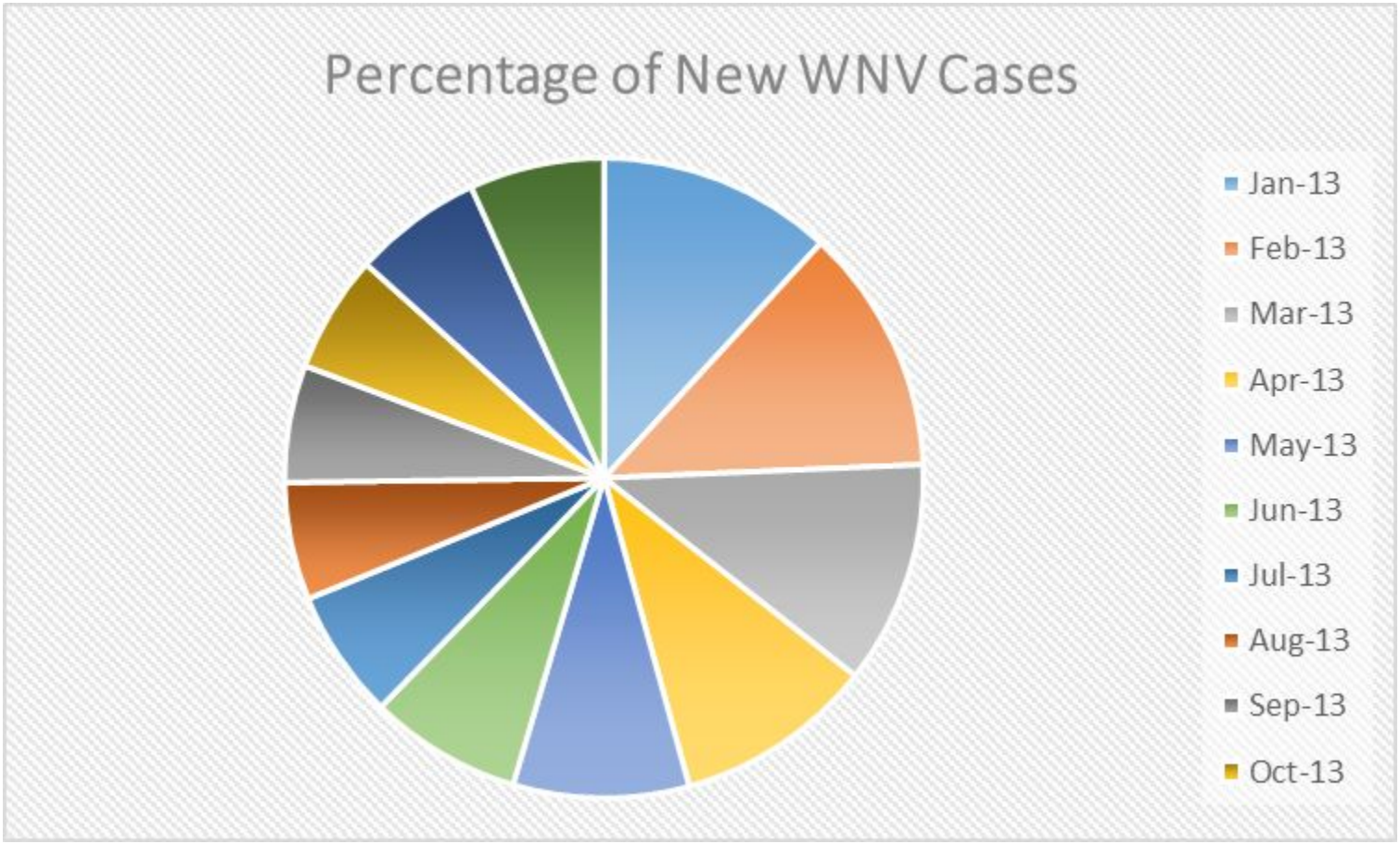
Distributed Cognition



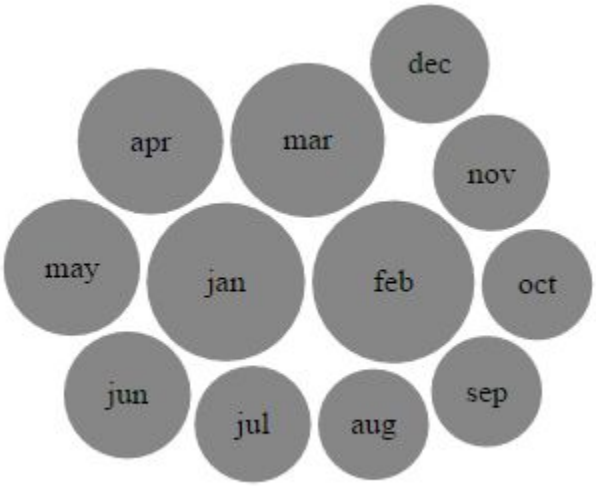
Back to Visualization

- So anything will work right?!

Back to Visualization

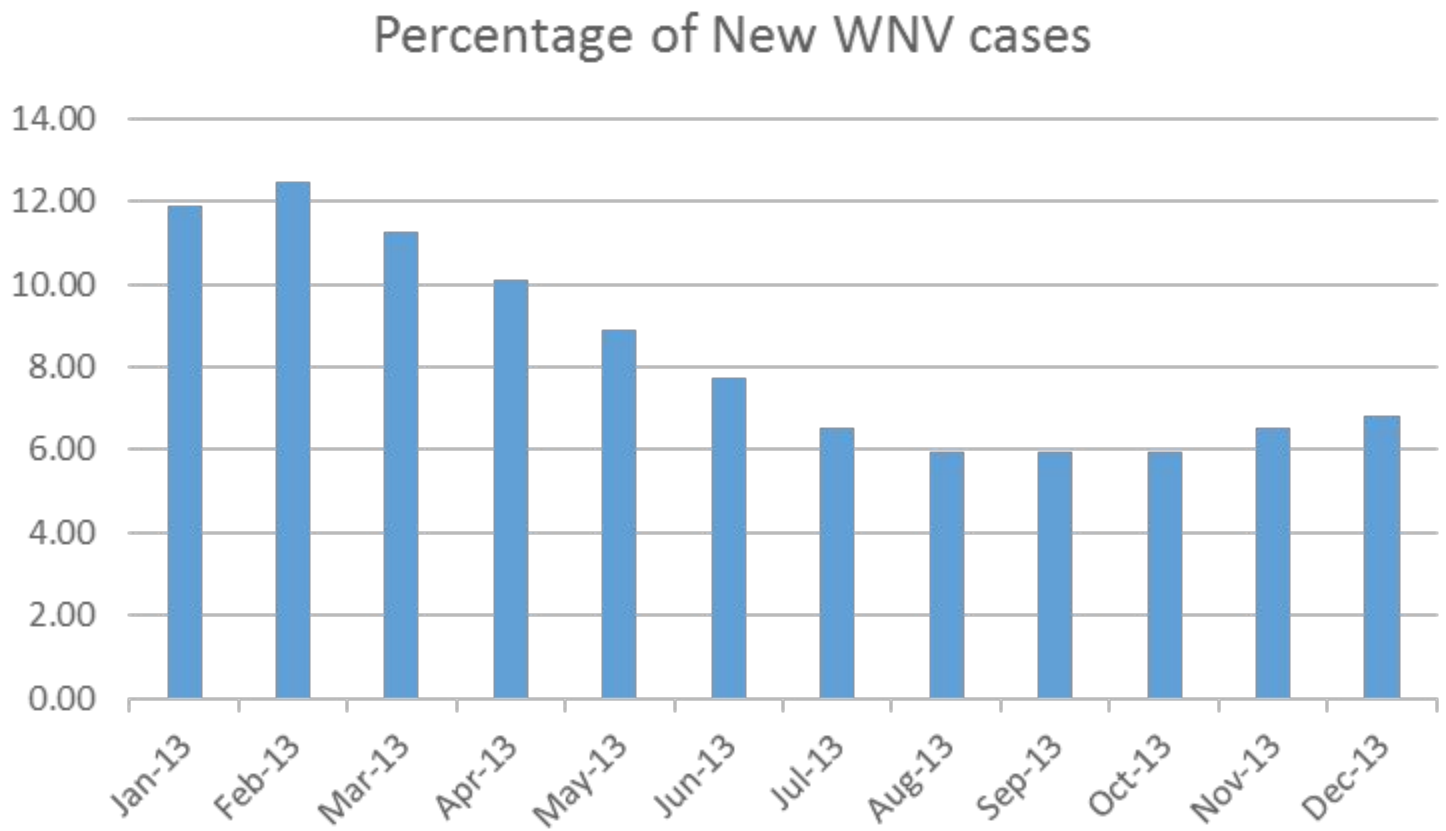


Back to Visualization

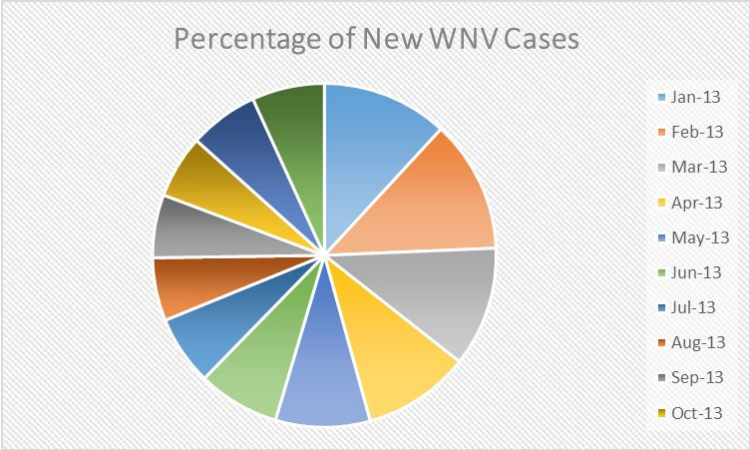


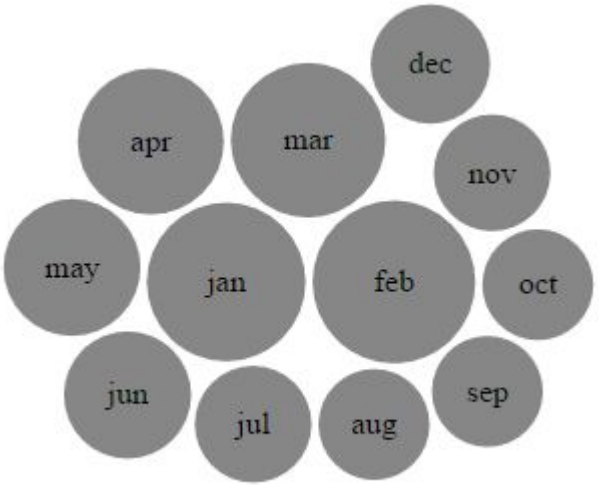
Back to Visualization

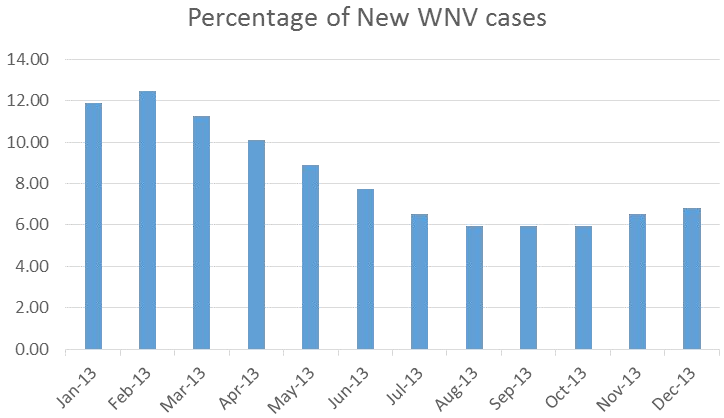
Back to Visualization

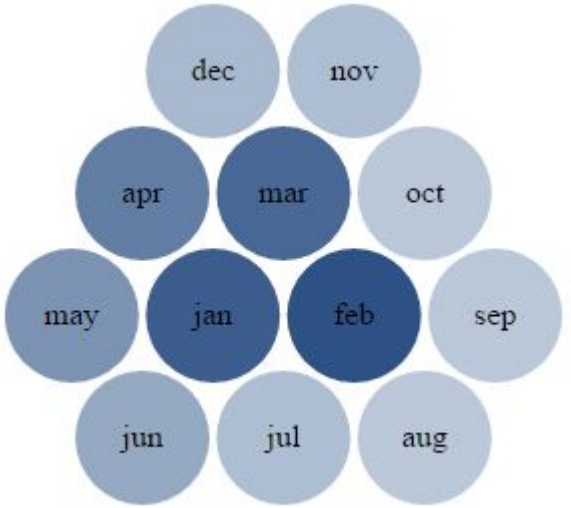


Back to Visualization









A Human-Centered Approach

- Consider:
  - intended audience or users
  - tasks to be performed
  - context

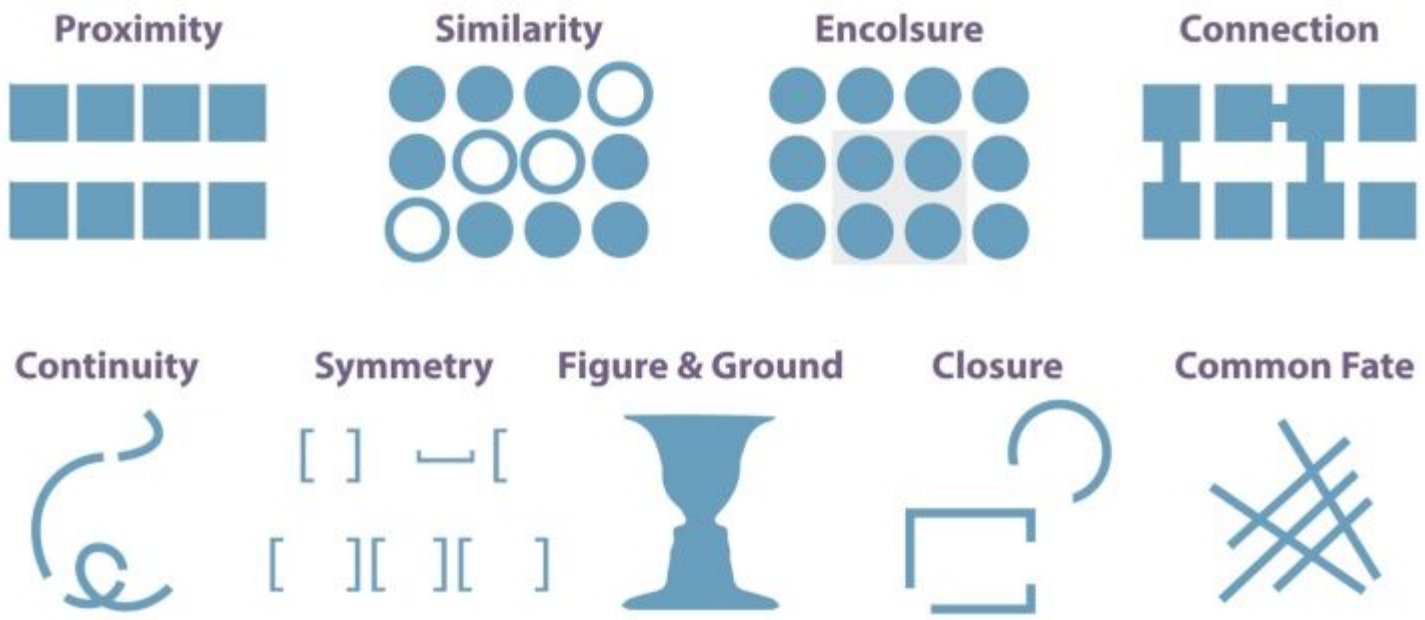
A Human-Centered Approach

- Learn about visual elements:
  - points
  - lines
  - surfaces
  - volumes

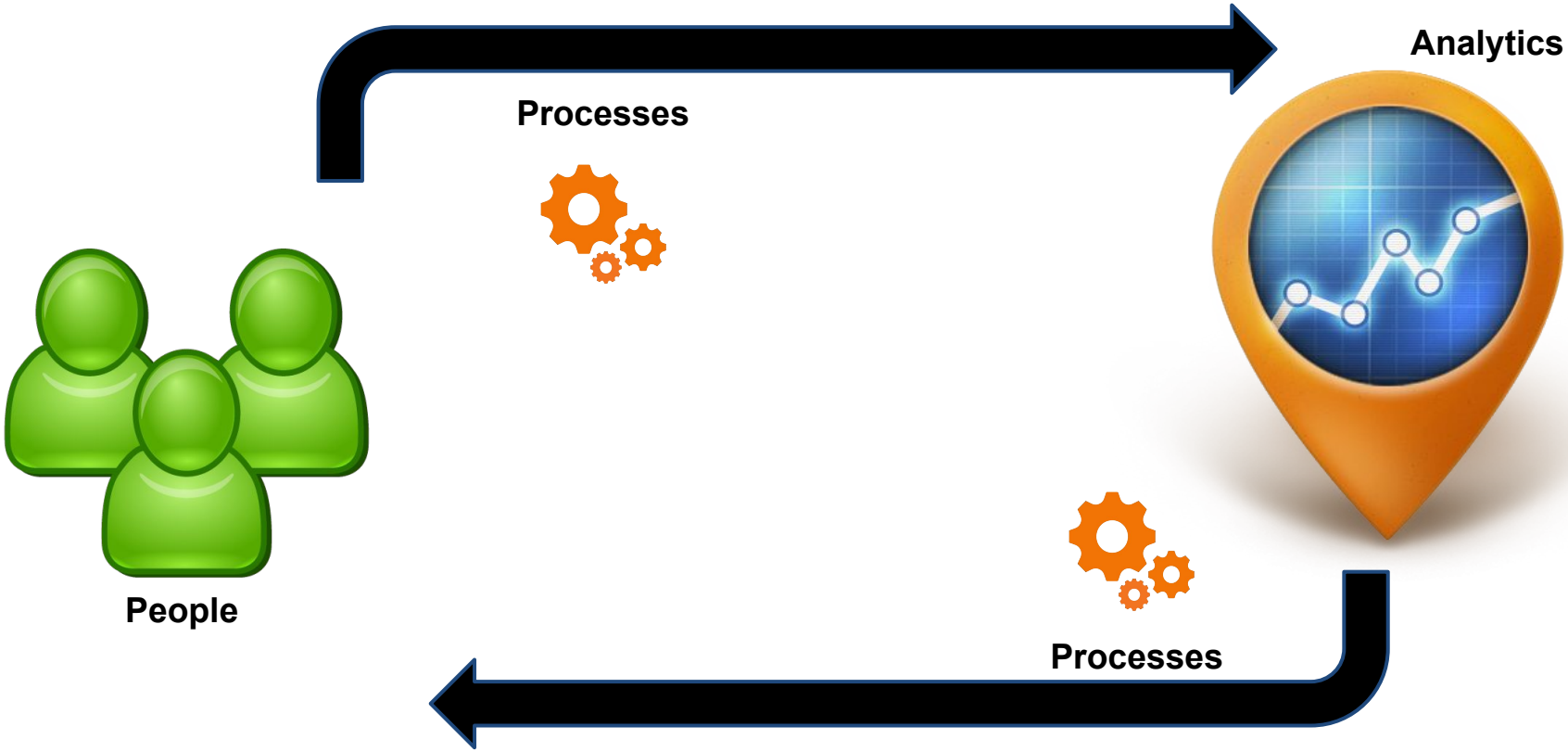
A Human-Centered Approach

- Learn about visual properties:
  - size/length
  - orientation
  - color
  - direction
  - area
  - texture
  - shape
  - curvature
  - shading
  - saturation
  - ...

Gestalt Principles

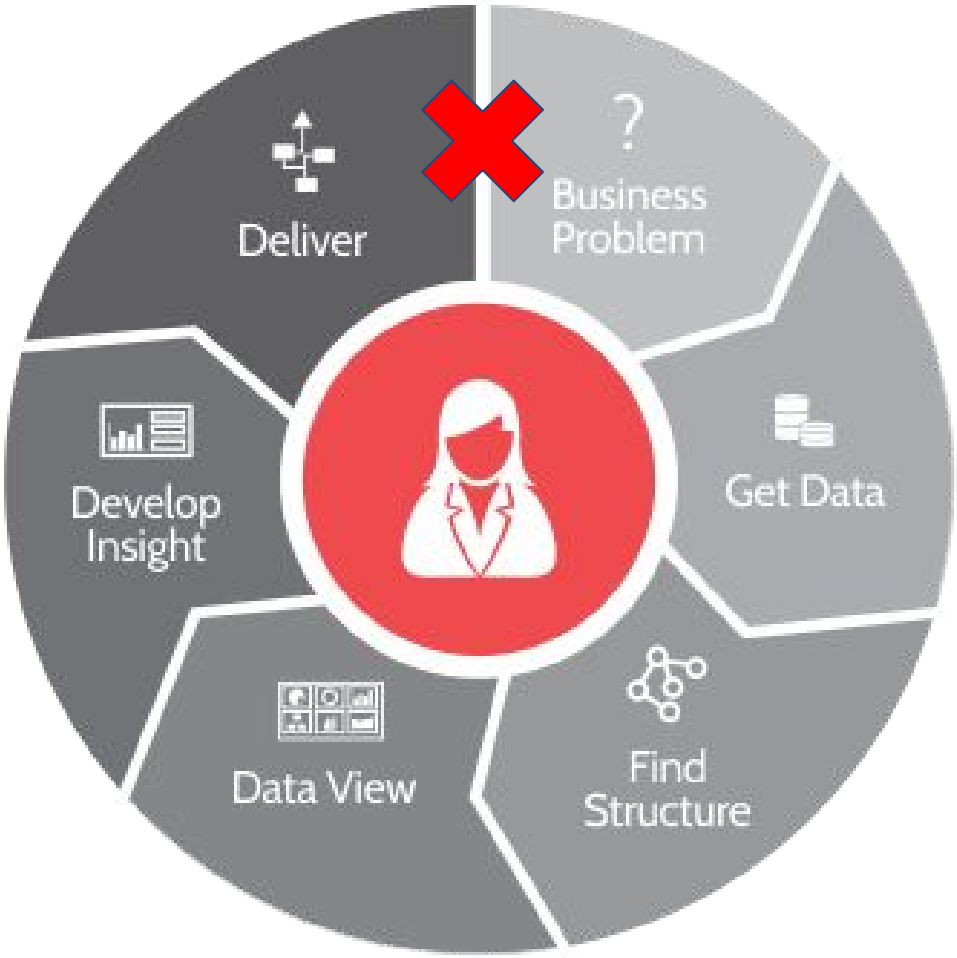


Human-Centered Analytics



Human-Centered Analytics

Human-Centered Analytics



Tools for Developers

1. D3.js
2. FusionCharts
3. Chart.js
4. Google Charts
5. Highcharts
6. Leaflet
7. dygraphs

Tools for Non-Developers

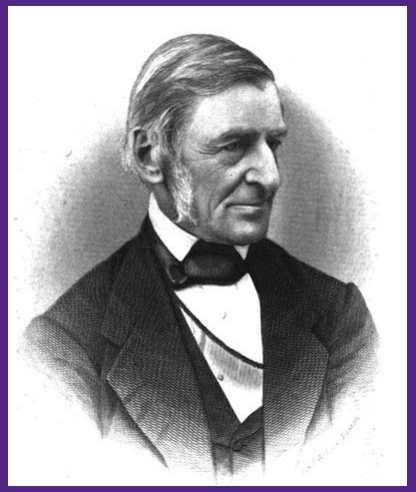
1. Datawrapper
2. Tableau
3. Raw
4. Timeline JS
5. Infogram
6. Plotly
7. ChartBlocks

OpenData Tools

1. visualizing.org
2. FlowingData
3. Google Chart Tools
4. GeoCommons
5. Quadrigram
6. Journalism in the Age of Data
7. JavaScript InfoVis Toolkit
8. Google Public Data Explorer
9. Maps Marker WP-Plugin
10. DataMaps.eu
11. Ushahidi
12. Eclipse BIRT

Knowledge exists to be imparted.

- Ralph Waldo Emerson



Western


TIME FOR
QUESTIONS