DS684 Cloud Computing Week 09

Regarding Labs and Assignments

 Class participation means more than Zoom attendance. You must actively participate in the discussion and labs, and answer questions.

- Must hit Submit button, otherwise no grade
- If you need extension in time, must send written request (<u>email</u>). Otherwise no grade and no makeup. Requests sent over Zoom chat do not count.
- For any technical difficulty (installation, Azure access, etc), you must send written explanation (<u>email</u>) before the deadline. Otherwise no grade and no makeup.

Teaching Schedule

Week 7: Azure Synapse Analytics Part I: Data Warehouse

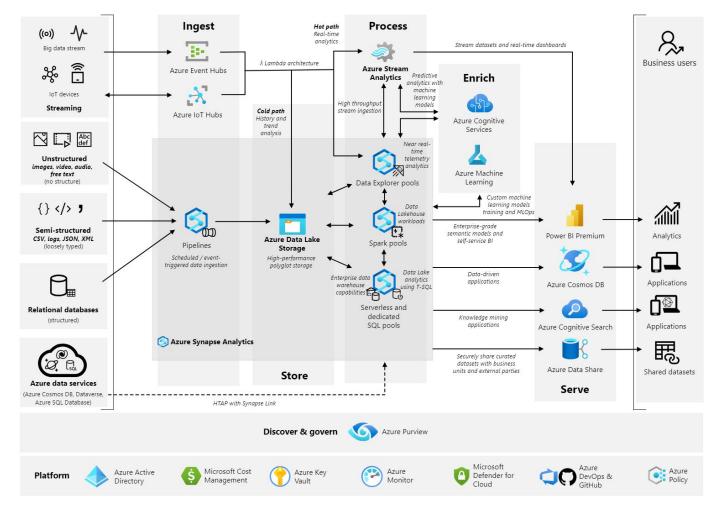
Week 8: Azure Synapse Analytics Part II: Data Engineering

Week 9: Visualization using Power BI

Week 10: Azure Machine Learning

Week 11: Final project presentation

Azure Data Related Services

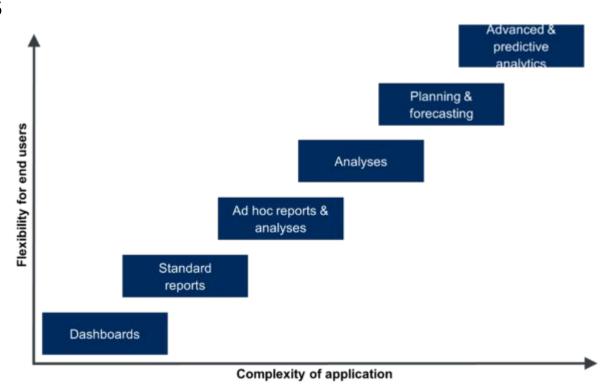




Agenda

- Visualization
 - Scattered Dot and Visual Characteristics
 - Visual Enhancements
 - Compare and Contrast
- The Good, the Bad, and the Ugly
 - The Greatest Visualization in Military History
- Telling a Complex Story
- Microsoft Power BI
 - Lab: Power BI

Levels of Analysis



Types of Data Analysis

- Dashboard (summarized)
 - Data visualization
- Static (operational) report
- Ad hoc reporting and Online Analytical Processing (OLAP)
 - Based on cube or based on databases
- Data analysis
- Planning and forcasting
 - Data science
- Machine learning/Artificial Intelligence

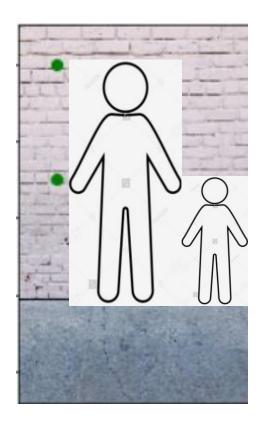
Dashboard Visualization

Why do you need to visualize data?

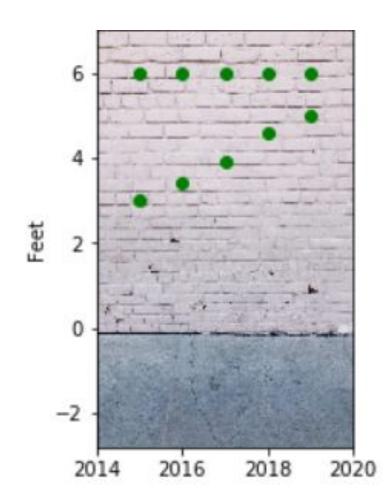
What can these two numbers tell you?

[3, 6]

Visualization



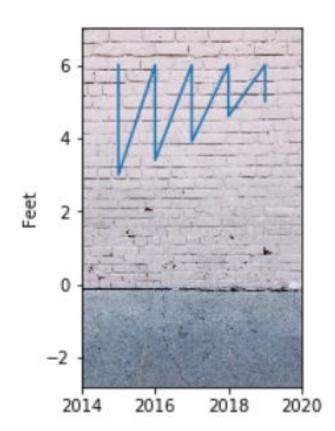
Trending



Story telling

Visualization is about storytelling

There are good visualizations and bad visualizations



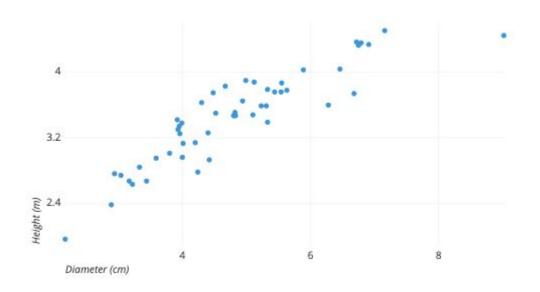
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Scattered Dot

All visualization starts from scattered dots.

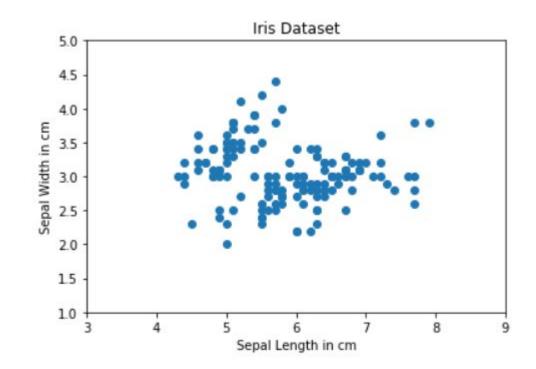
Use scattered dot first for pattern discovery



Iris Dataset

Sometimes, the pattern is not so clear. Further analysis is needed

Iris dataset: measurement of 3 different species of Iris ===>



Visualization Characteristics

- Color
- Size
- Position: X axis and Y axis
- Shape (line, circle, rectangle)
- Background
- Placement

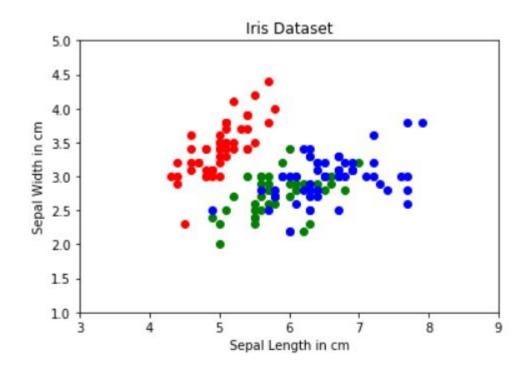
Position

Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services



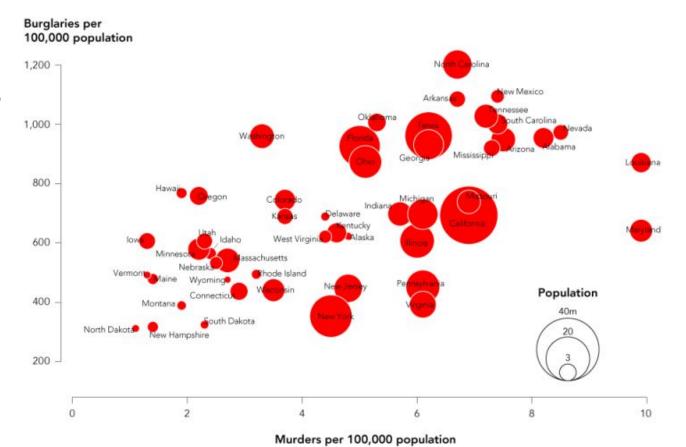
Iris Dataset

Use color to group dots



Size

But, does size deliver any information here? If not, we may not need it.

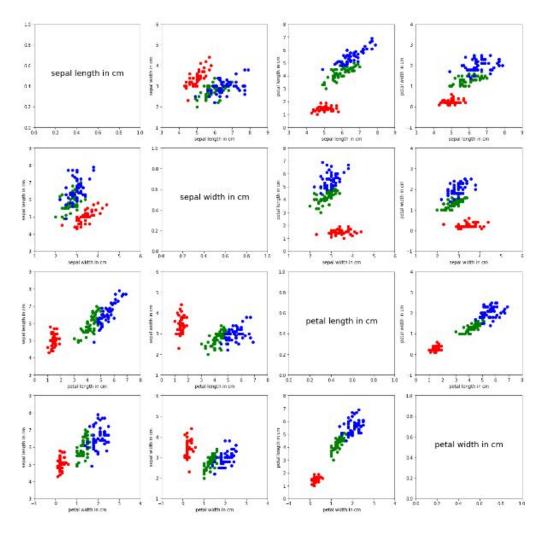


Color and Size



Characteristic Selection

Choose the characteristics (X-Y axial and color in this case) that can make the story more compelling



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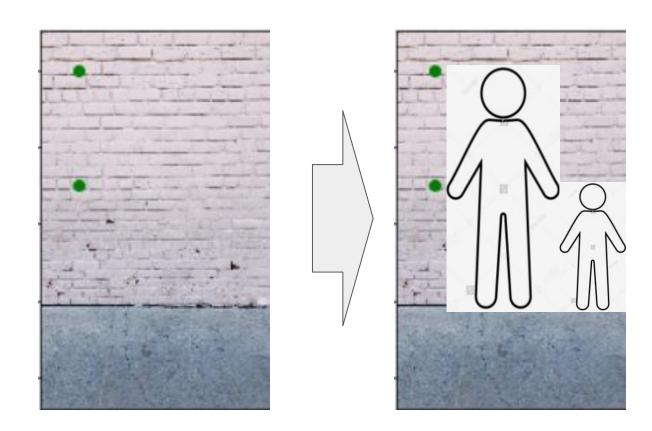
Turn Dots into Shapes

Scattered dot can show patterns. Patterns can be further visualized using shapes

- Line
- Bar
- Pie

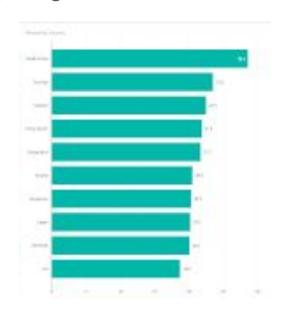
Bar chart

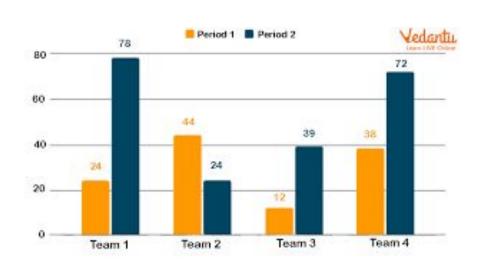
Use shape to signify the dots



Bar chart

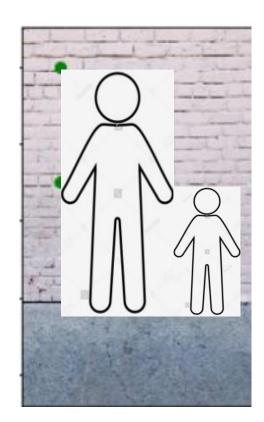
Comparing numbers for a discrete number of groups (and subgroups)

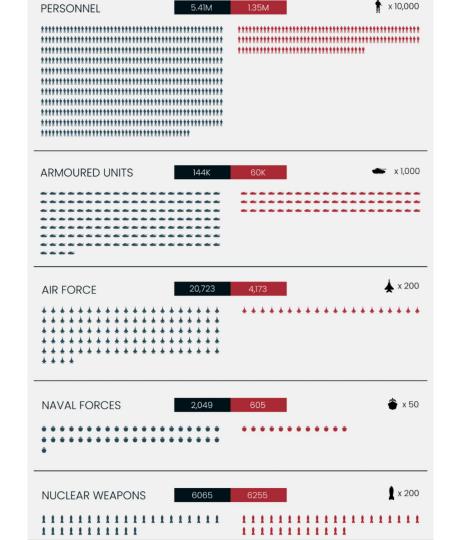




Bar chart

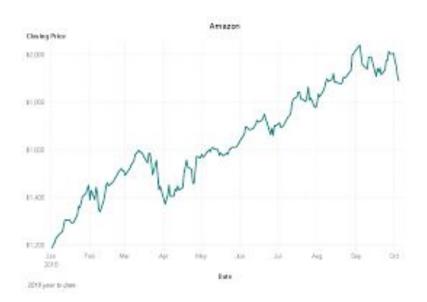
Not necessarily just bars

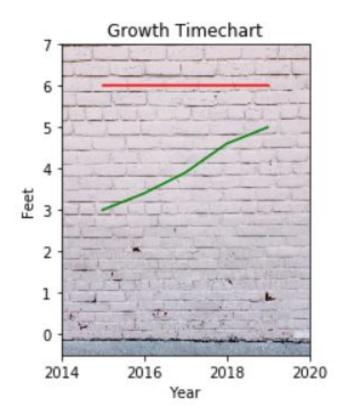




Line chart

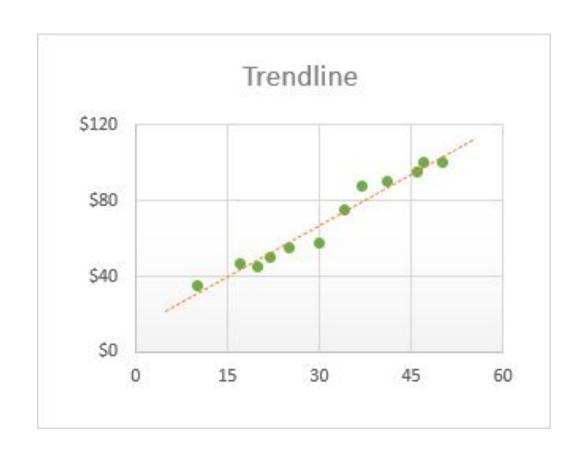
Continuous. Usually used for continuous series, such as time series.





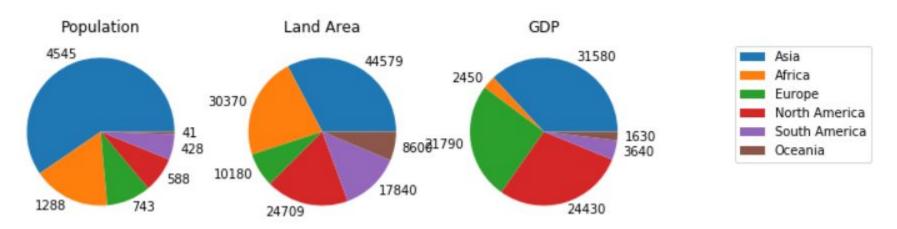
Trend Line

Use trend line to indicate statistics characteristics



Pie chart

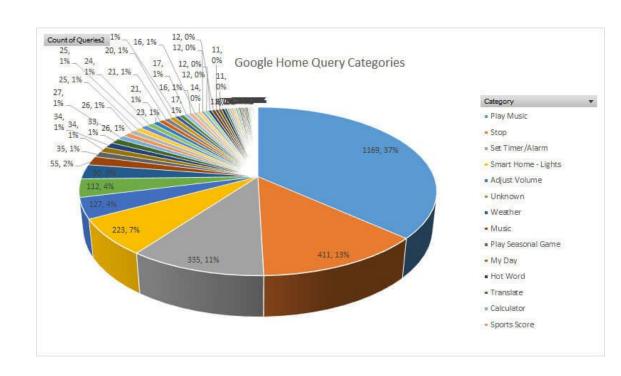
Percentage, portion: Only use it when the story is simple (or at the beginning of story)



Pie chart

Avoid using pie charts when

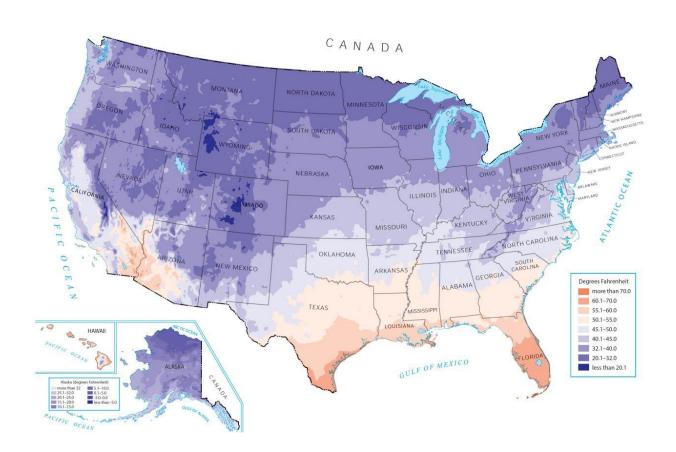
- there are a large number of groups, or
- there are a number of groups with small percentages



Background

Most common background: map

Scattered dot plotted based on longitude and latitude.



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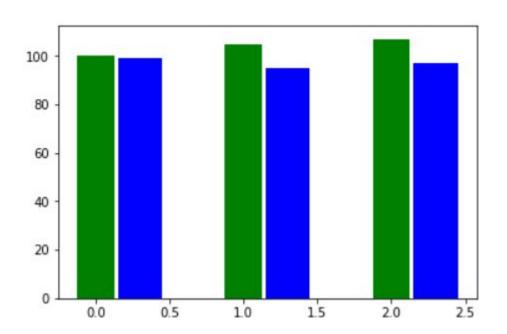
Compare and Contrast

Use same scale/background but different visualization characteristics (most common: color) to show the difference or similarity

Compare and Contrast

Subgroups within same chart

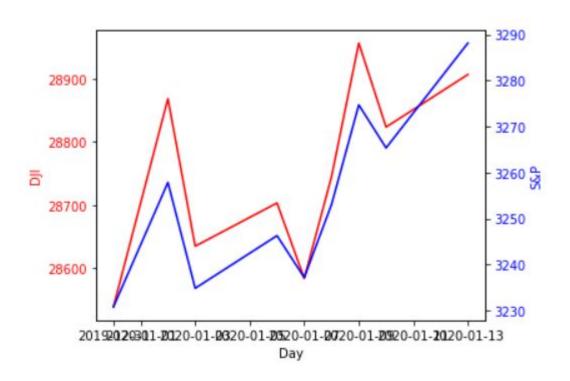
Good for contrast of discrete groupings and sub groupings



Compare and Contrast

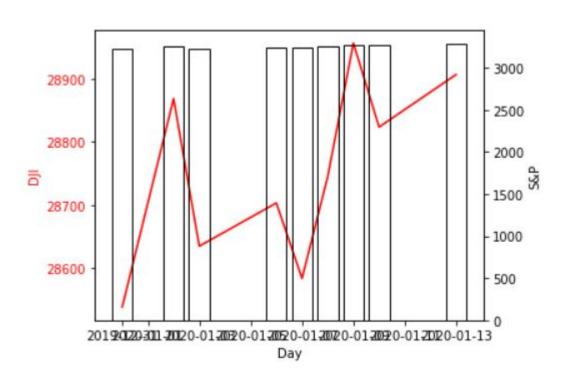
Make sure you show clearly whether it is compare (similarity) or contrast (difference)

Note: the scale is different here, so that comparison is misleading.



Heterogenous Chart

One data series is used as background for another



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What is Data Visualization about?

Data visualization is about storytelling.

- Make your story easier to understand
- Don't over complicate your story

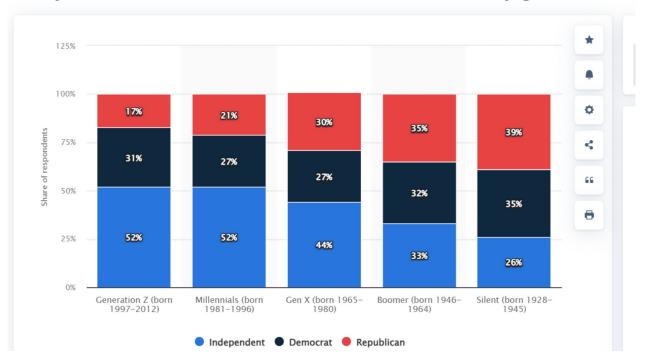
Follow Conventions

Color: Blue vs Red

Placement: independent in the middle

Axis: Limit to 100%

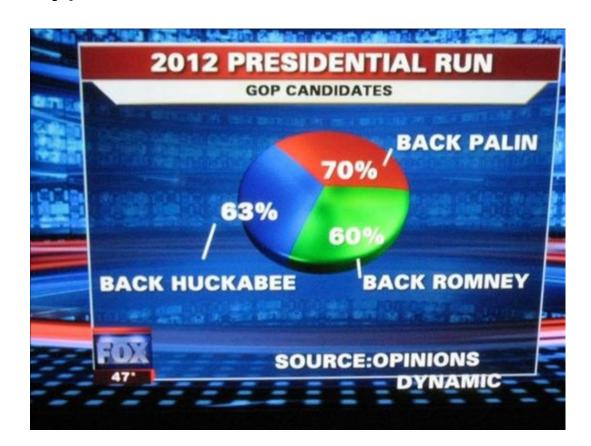
Party identification in the United States in 2022, by generation



Choose the Right Type

63 % + 70% + 60% = 193%

Pie charts should always add up to 100%



Rule of 3 and Rule of 7

Unless there is a simple and clear pattern,

- Do not show more than 3 types of visualization hints
- Do not show more than 7 data groupings

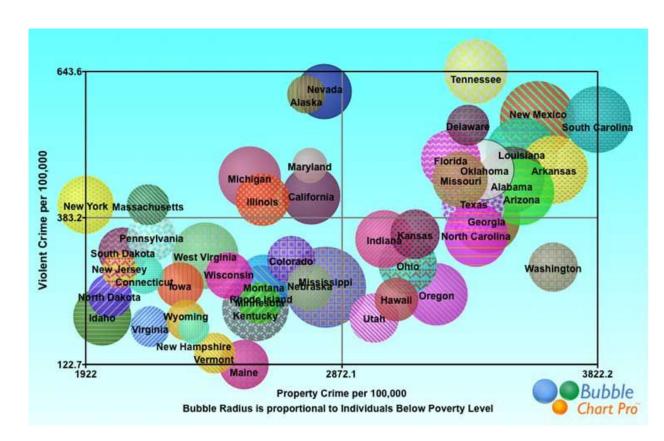
What is this visualization trying to tell us?



Colorful != Helpful

Color should be used for grouping or as an indicator

Do not apply one color for each scattered dot



Colorful != Helpful

Does red and gray mean anything special here?

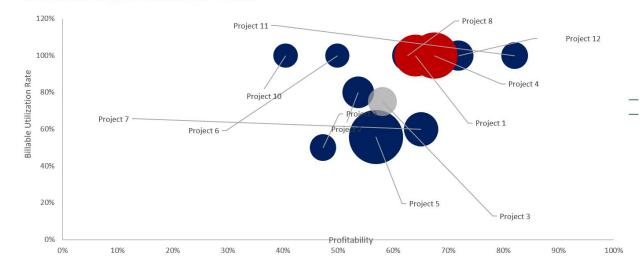
Follow conventions:

red: alert, exception;

grey: inactive

Project evaluation by BUT and Profitability

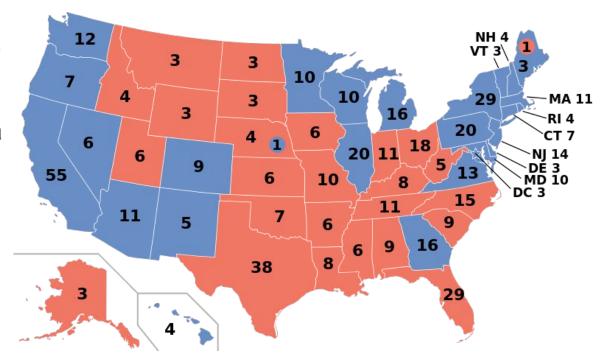
All Customers by entity | 2021-W46 | Budget >400 hours



Use Map with Caution

Map background can be both a blessing and a curse

- Conveniently show geography related data
- Limited by the nature of geography



Agenda

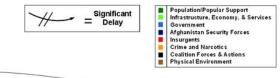
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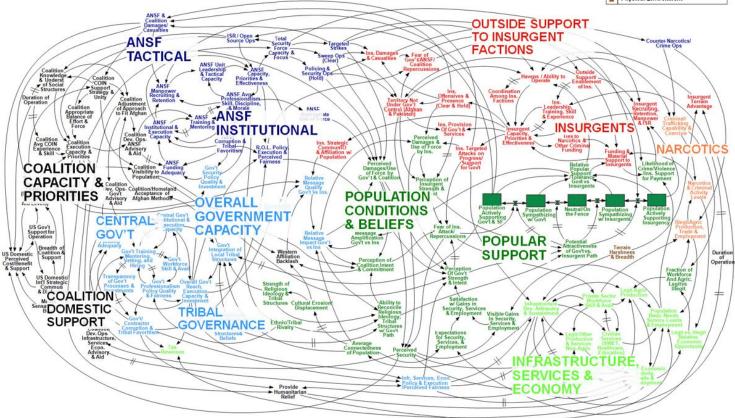
The Greatest Visualization in Military History

When we understand that slide, we'll have won the war

US military General Stanley McChrystal

Afghanistan Stability / COIN Dynamics



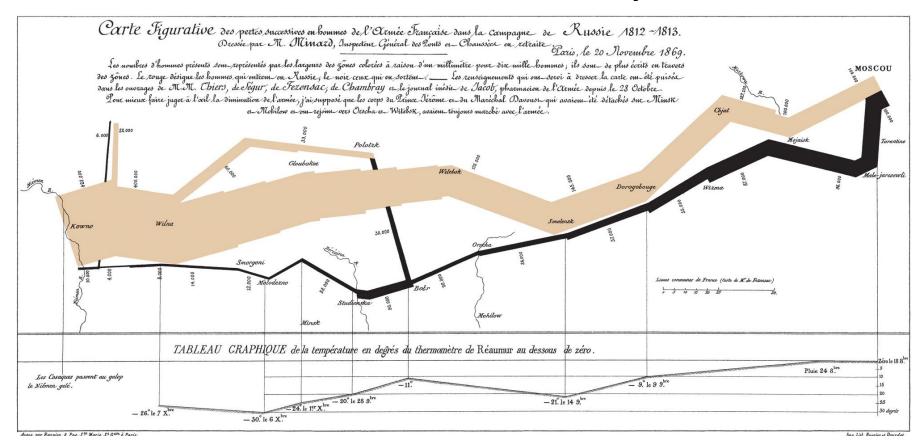




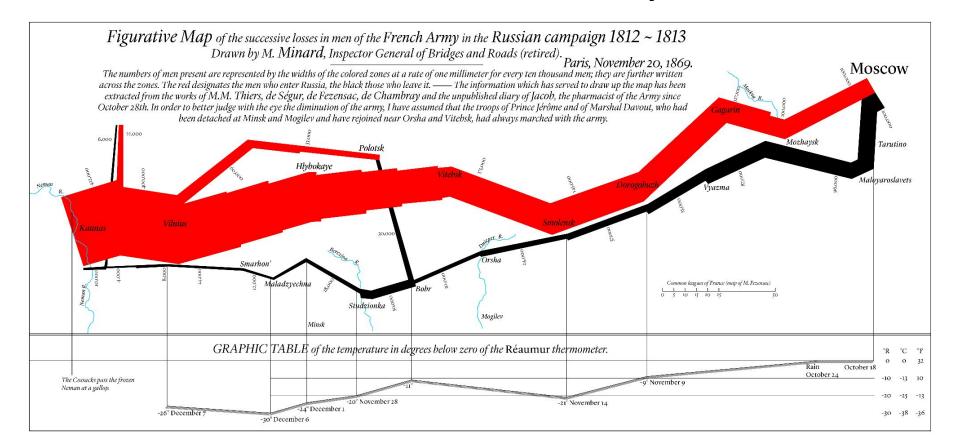
The Greatest Visualization in Military History - The Real One

"Carte figurative des pertes successives en hommes de l'Armée française dans la campagne de Russie en 1812-1813", is a graphical depiction of the losses of French Army during Napoleon's ruinous invasion of Russia of 1812-13, drawn in 1869 by Charles Joseph Minard, a former French civil engineer.

The Greatest Data Visualization in History



The Greatest Data Visualization in History



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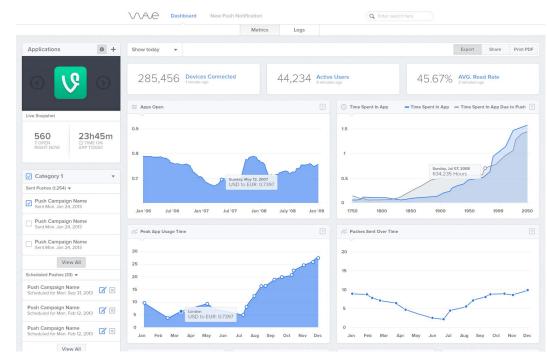
How to Tell a Complex Story

- Define a story line
- Use multiple visualizations
- Arrange in a logical order
- Arrange in separate pages/tabs and use links to connect the story line

Element Placement

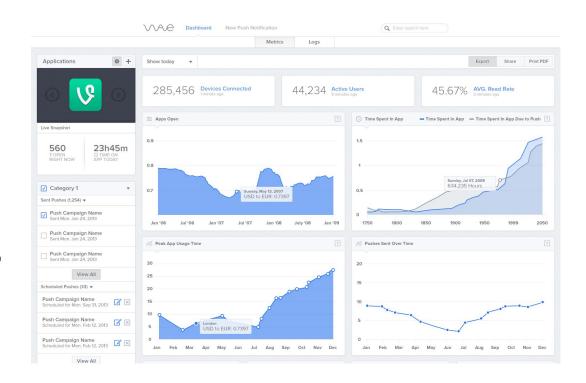
In societies where writing starts from left to right, human eyes usually

- start at the upper left corner,
- then horizontally move to the right,
- then move back to upper left corner and
- then moves down,
- then take a glance at the bulk page



Element Placement

- Upper left corner: titles, icons
- Top horizontal bar: key indicators
- Left vertical bar: break downs, links
- Main area: visualizations, maps
- Right vertical bar: filters, notes



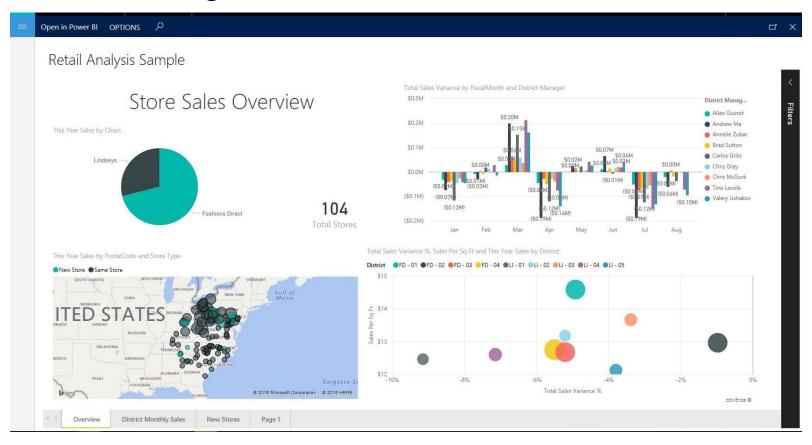
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Microsoft Power BI

Microsoft's flag business intelligence tool, capable of different levels of business intelligence reporting

Dashboard using Power BI



Power BI Operational Report Example

Category		_			
	Status	Avg Price	Last Year	This Year	Goal
100-Groceries	•	\$1.36	\$810,176	\$829,776	\$810,176
090-Home		\$3.28	\$2,913,647	\$3,053,326	\$2,913,647
080-Accessories	•	\$4.22	\$1,273,096	\$1,379,259	\$1,273,096
070-Hosiery	•	\$3.57	\$573,604	\$486,106	\$573,604
060-Intimate		\$4.02	\$955,370	\$852,329	\$955,370
050-Shoes	0	\$13.73	\$3,640,471	\$3,574,900	\$3,640,471
040-Juniors		\$7.06	\$3,105,550	\$2,930,385	\$3,105,550
030-Kids	0	\$5.20	\$2,726,892	\$2,705,490	\$2,726,892
020-Mens	0	\$6.89	\$4,453,133	\$4,452,421	\$4,453,133
010-Womens		\$6.70	\$2,680,662	\$1,787,958	\$2,680,662
Total	0	\$5.19	\$23,132,601	\$22,051,952	\$23,132,601

Microsoft Power BI

Navigate through multiple tabs

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Power BI Lab

- Open Power Bl
- Introduce Iris dataset
- Create grid report
- Create scattered dot chart
- Create bar chart
- Create line chart

Final Project

Review Assignment 08

Table creation

Assignment 09

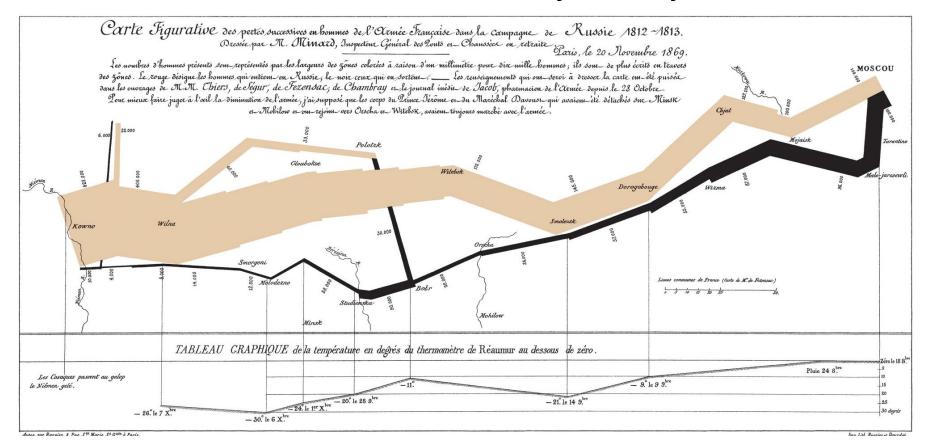
Visualize the data you got from previous assignments

Final Thoughts about Data Visualization

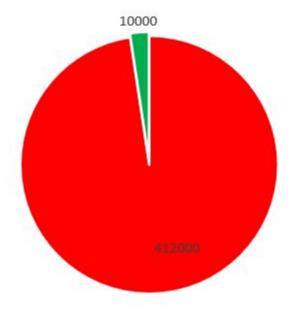
It is all about storytelling!

Design your visualization based on your story, not the other way around!

The Greatest Visualization in Military History



What did Napoleon need from a visualization



Assignment

