Q: Which Gestalt Principles is most applicable to this image?

iClicker

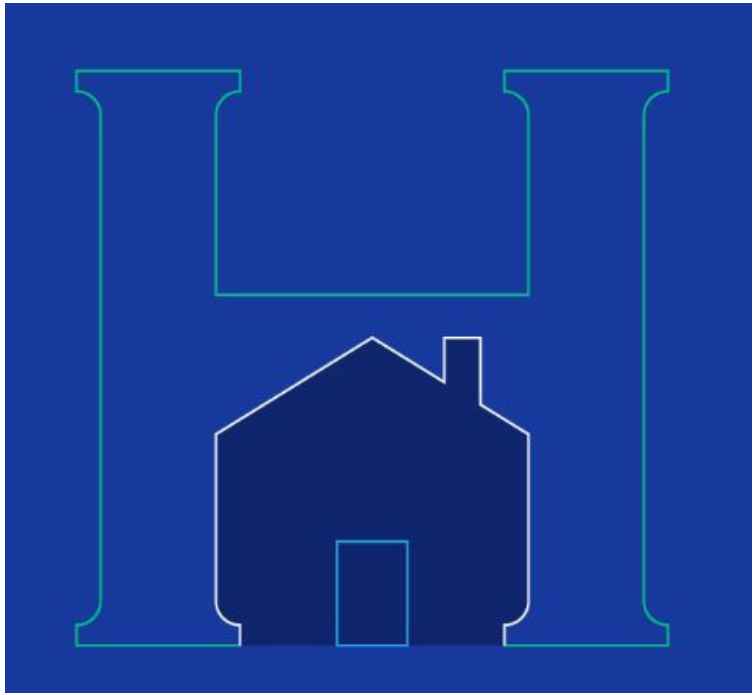
A. Figure/Ground

B. Invariance

C. Pragnanz

D. Similarity

E. Symmetry and Order



CPSC 100

Computational Thinking

From Perception to Story:
Static Visual Design & Storytelling

Instructor: Parsa Rajabi
Department of Computer Science
University of British Columbia

Agenda

- Course Admin
- Learning Goals
- Static Visual Design:
  - Types of Visualizations
  - Storytelling


Hello
SPRING

Invariance

Course Admin

Course Admin

- **PC Quiz 6** *(don't leave this until Sunday!)*
  - Due Sunday, March 23, 11:59pm
- **Lab 7 Infographic Critique**
  - Due Friday, March 21, 11:59pm
- **Project Milestone 3** *(have you started yet?! If not, it's time to do so)*
  - Due Friday, April 7, 11:59pm
- **Final Exam**
  - Tuesday, April 22, 7pm; Location: SWING 121

Learning Goals

Learning Goals

After this **today's lecture**, you should be able to:

- Explain how different chart types are used to represent and compare data.
- Apply knowledge of data types (categorical, quantitative) to select suitable visualizations to convey information.
- Explain how different visualizations contribute to an effective data story.

After watching the **take-home video**, you should be able to:

- Differentiate between effective and ineffective use of **visualization channels** in data representation.

Visualization Design

Activity

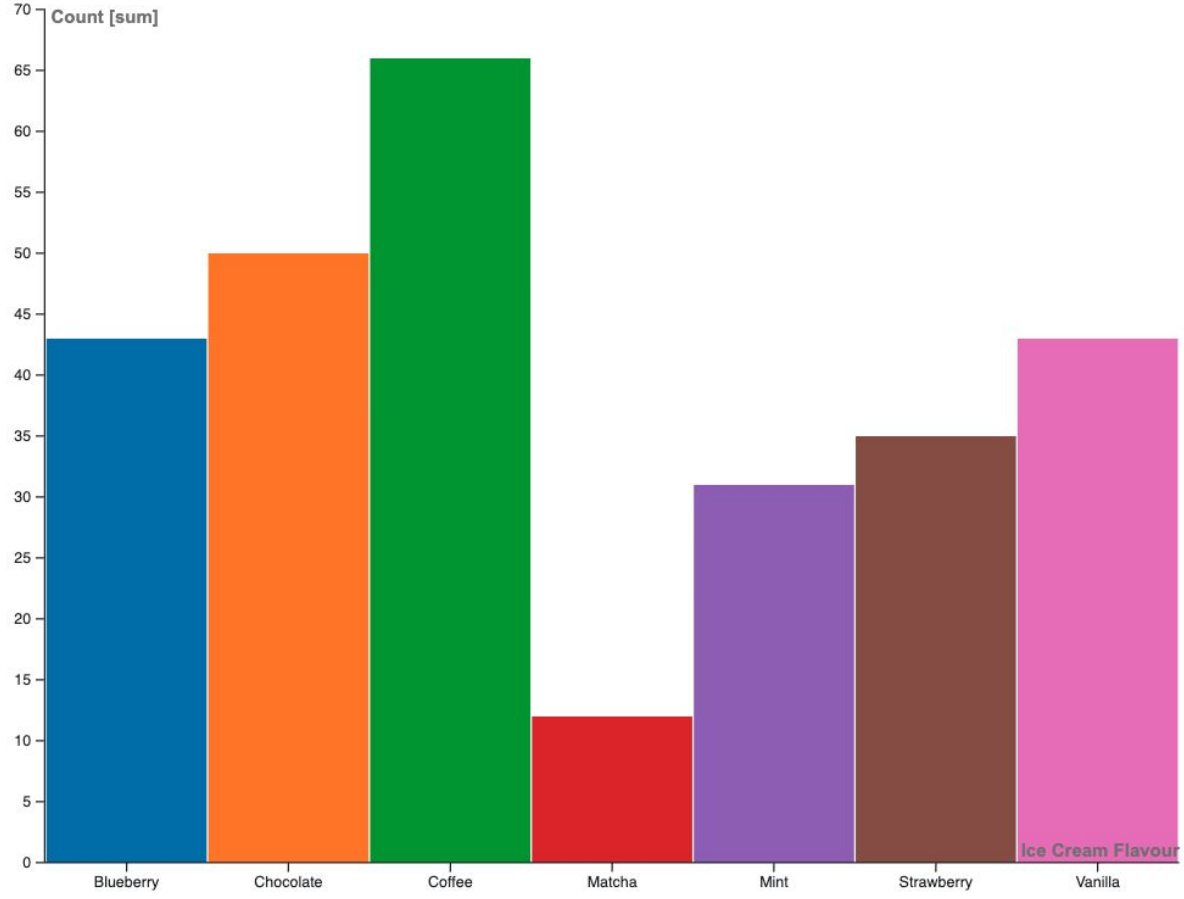
Recall

- Visualize the dataset below in at least 5 different ways.
- Sketch on paper
  OR use a tool (e.g.Excel)

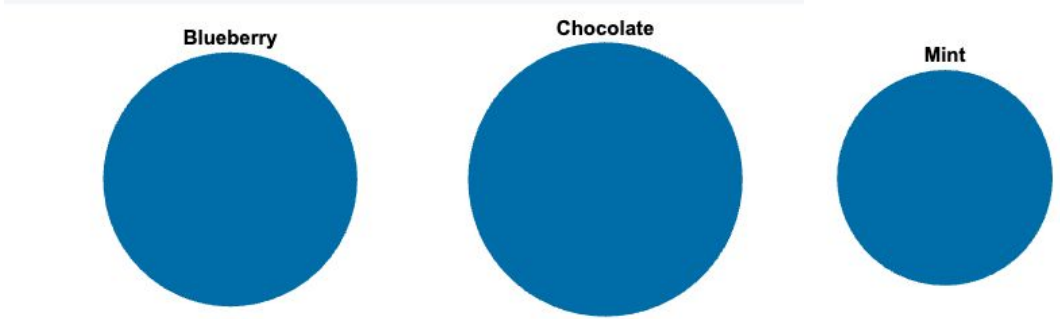
Ice Cream Flavour	Count
Chocolate	50
Vanilla	43
Mint	31
Strawberry	35
Matcha	12
Blueberry	43
Coffee	66

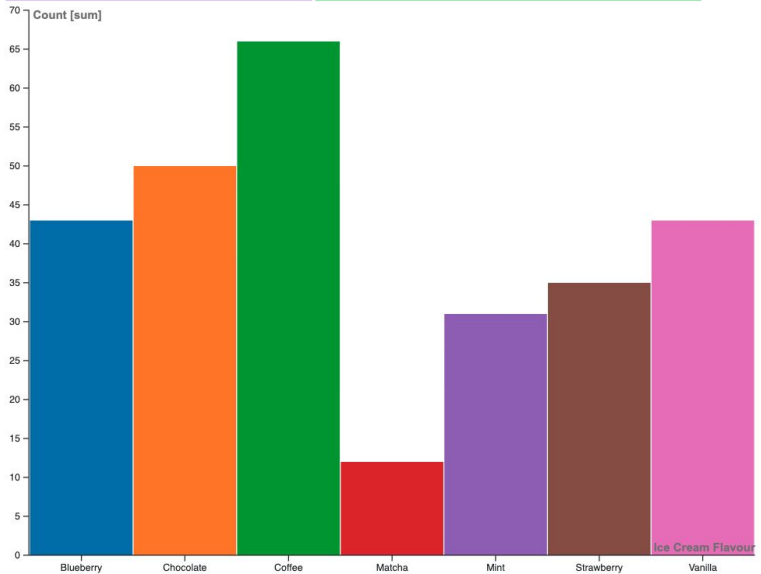

Chocolate
Strawberry
Matcha
Blueberry
Vanilla
Coffee
Mint

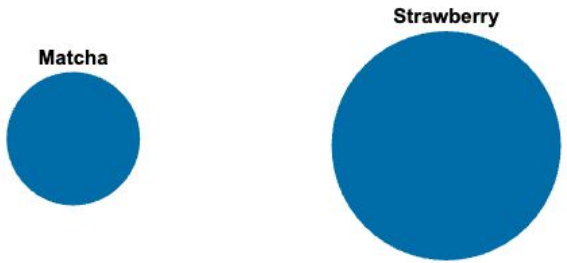

Chocolate
Strawberry
Matcha
Blueberry
Vanilla
Coffee
Mint

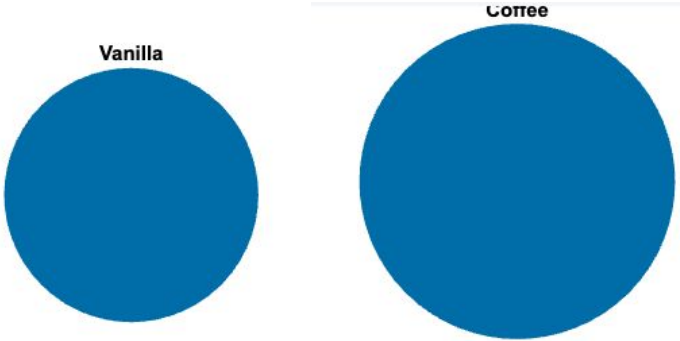

Count [sum]
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Blueberry
Chocolate
Coffee
Matcha
Mint
Strawberry
Vanilla
Ice Cream Flavour


Chocolate
Strawberry
Matcha
Blueberry
Vanilla
Coffee
Mint

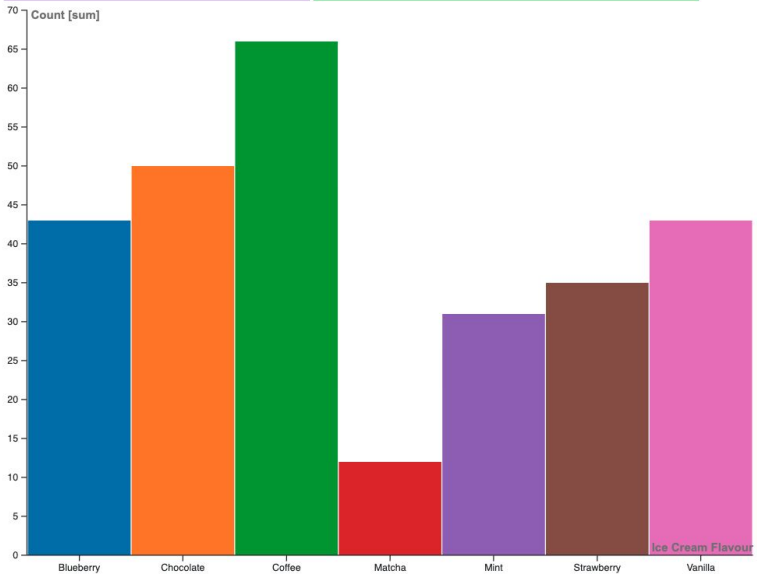

Blueberry
Chocolate
Mint

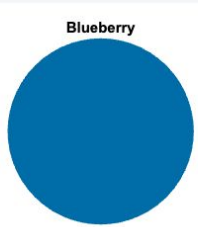

Count [sum]
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Blueberry
Chocolate
Coffee
Matcha
Mint
Strawberry
Vanilla
Ice Cream Flavour

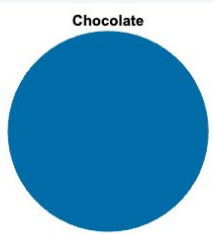

Matcha
Strawberry

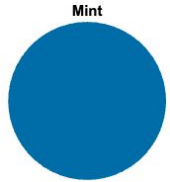

Vanilla
Coffee

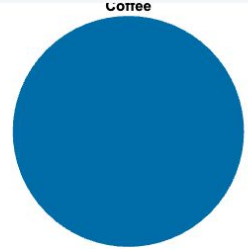

Chocolate
Strawberry
Matcha
Blueberry
Vanilla
Coffee
Mint


Count [sum]
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Blueberry
Chocolate
Coffee
Matcha
Mint
Strawberry
Vanilla
Ice Cream Flavour

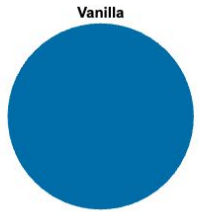

Blueberry

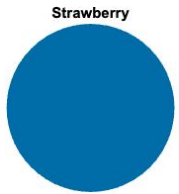

Chocolate


Mint


Coffee


Matcha


Vanilla


Strawberry

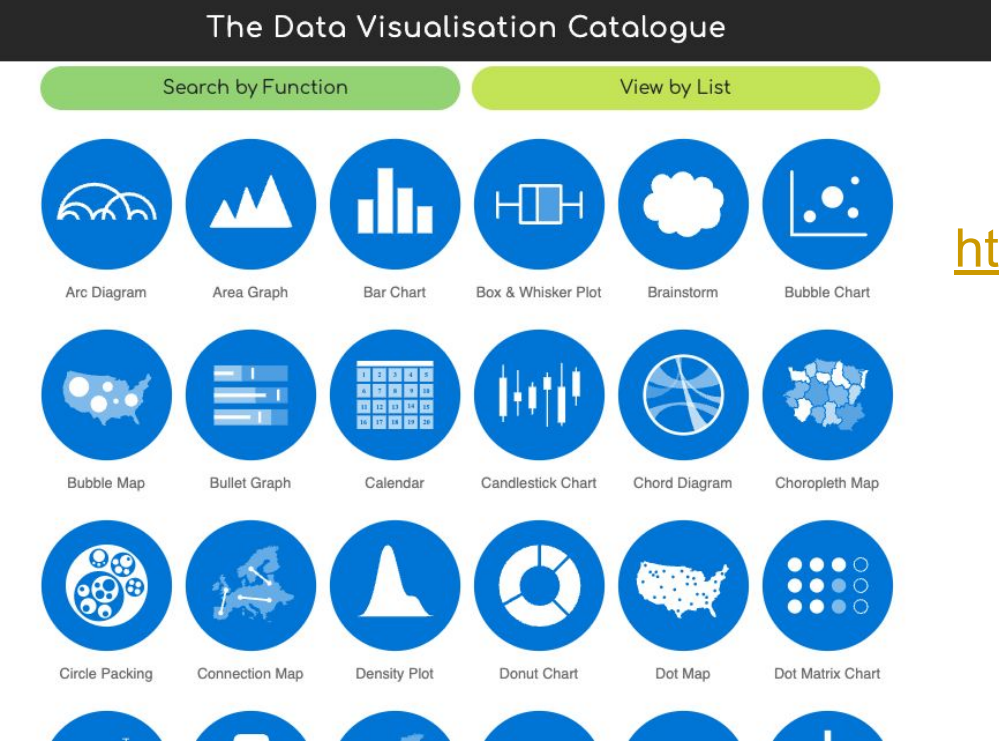

chocolate
coffee
matcha
vanilla
blueberry
strawberry
mint

Data Types

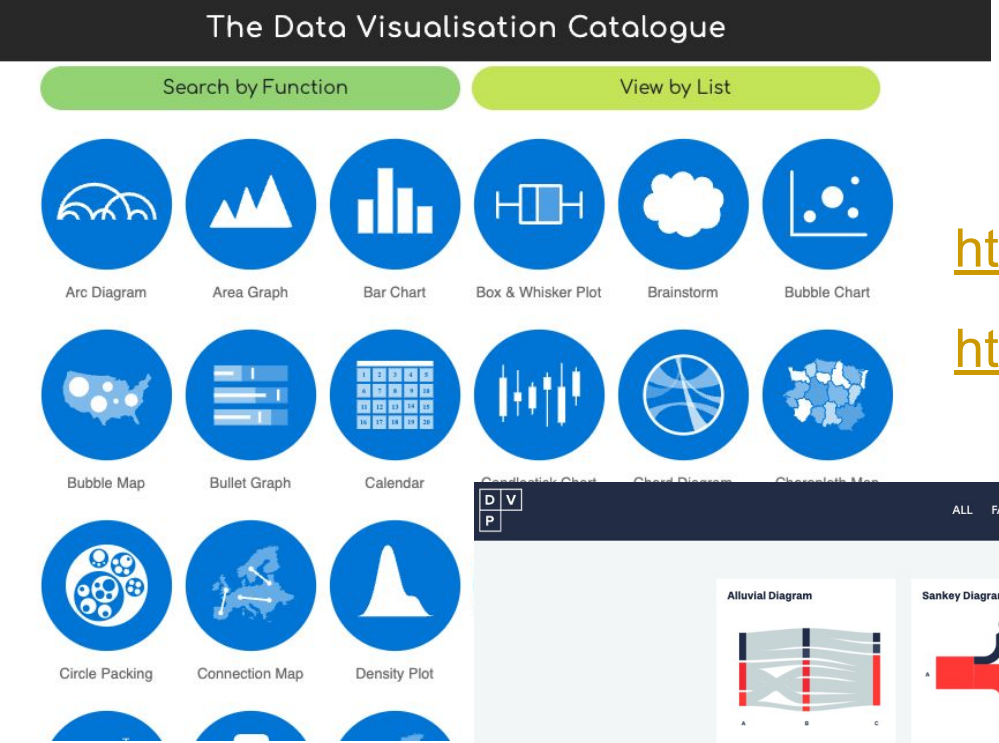
- **Categorical Data**
  - Represents distinct groups or labels (e.g., cities, ice cream flavors, departments)
  - Typically non-numeric, though can be encoded as such
- **Numerical (Quantitative) Data**
  - Measures quantities
  - Can be discrete (counts) or continuous (time, temperature)
- **Multivariate Data**
  - Contains more than two variables per observation

Visualization Zoo

- **Comparing Categories**
  - Bar Chart: Bar, Stacked Bar, Grouped Bar
  - Pie Chart
- **Discovering Temporal Trends**
  - Line, Multi-Line, Area Charts
- **Multiple Attributes**
  - Radar Chart, Bubble Charts, Parallel Coordinates
- **Visualizing Relationships and Hierarchy**
  - Tree Maps, Scatterplots, Tree Diagrams, Network Graph



https://datavizcatalogue.com/index.html



https://datavizcatalogue.com/index.html

https://datavizproject.com/#

Visualization Zoo

- **Comparing Categories**
  - **Bar Chart: Bar, Stacked Bar, Grouped Bar**
  - **Pie Chart**
- Discovering Temporal Trends
  - Line, Multi-Line, Area Charts
- Multiple Attributes
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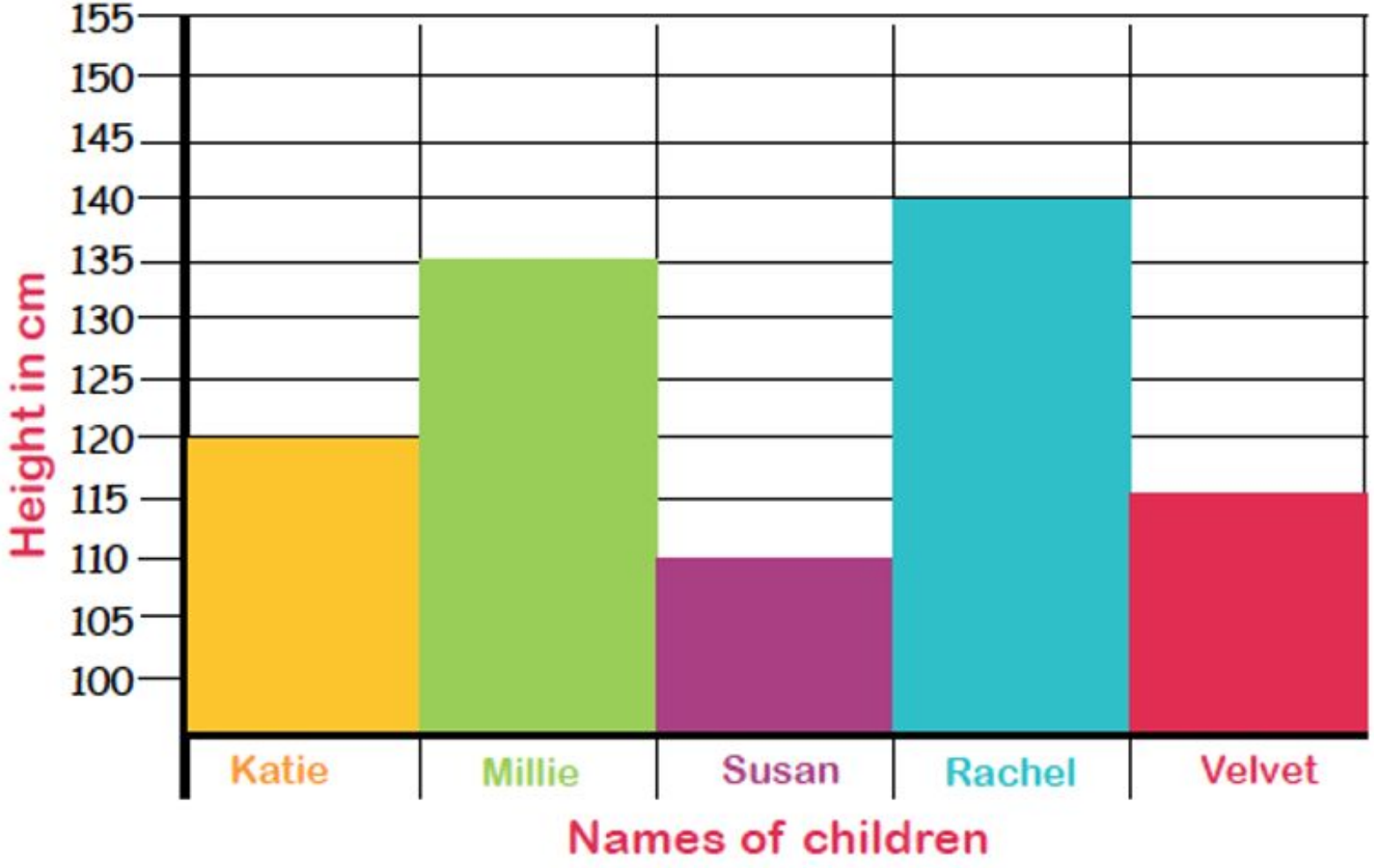
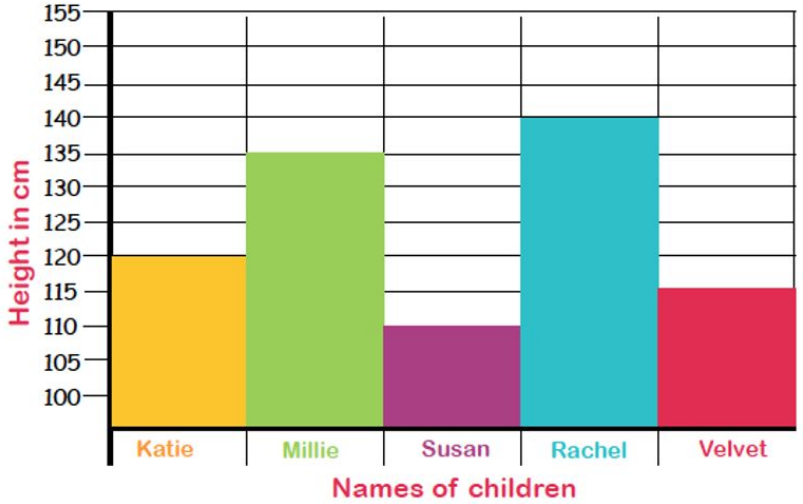

155
150
145
140
135
130
125
120
115
110
105
100
Height in cm
Katie
Millie
Susan
Rachel
Velvet
Names of children

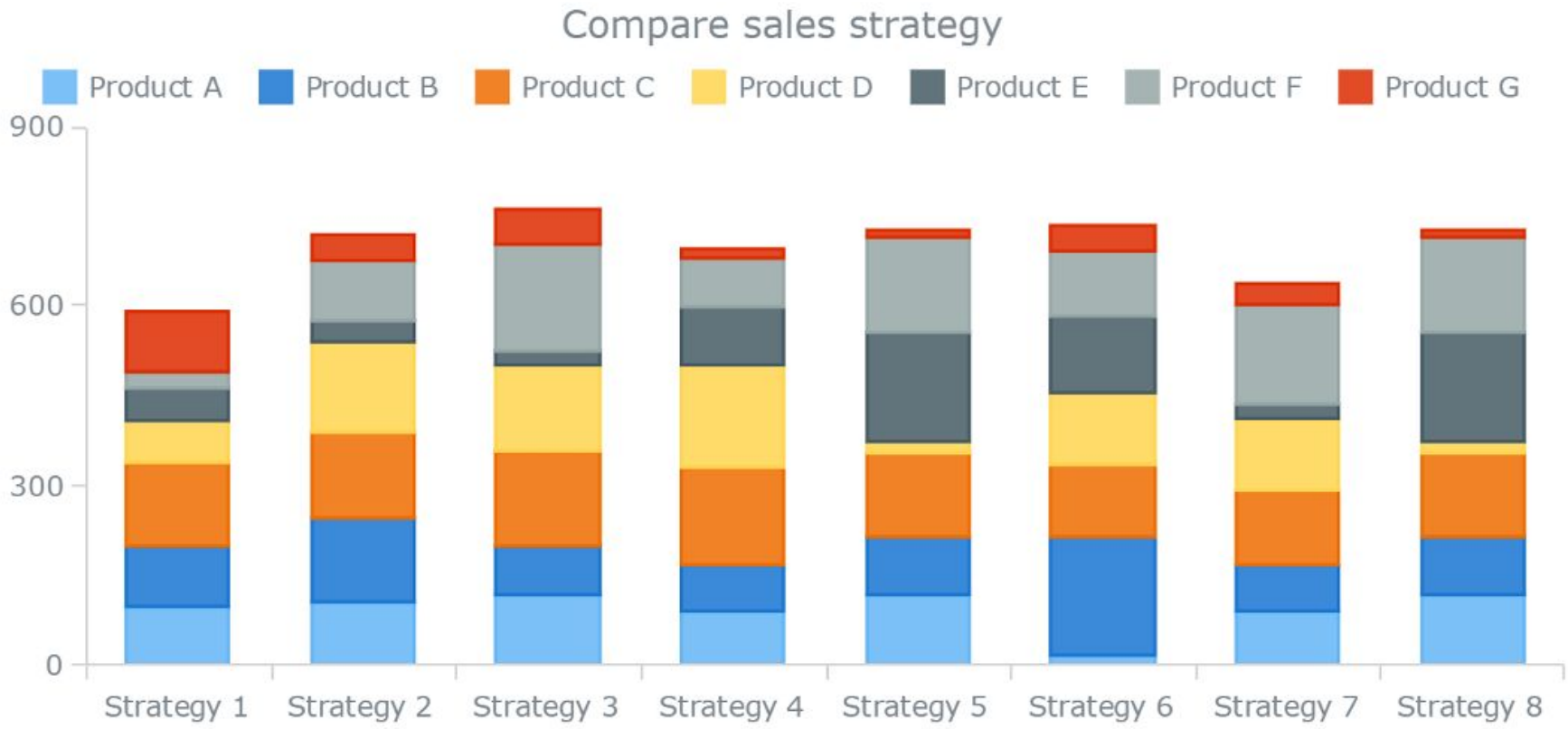
Bar Chart

- Use for comparing discrete categorical data (e.g., product sales, survey responses)
  - Answers the question of "how many?" in each category.
- it does not display **continuous developments** over an interval
- Easily readable and interpretable.

Data type:

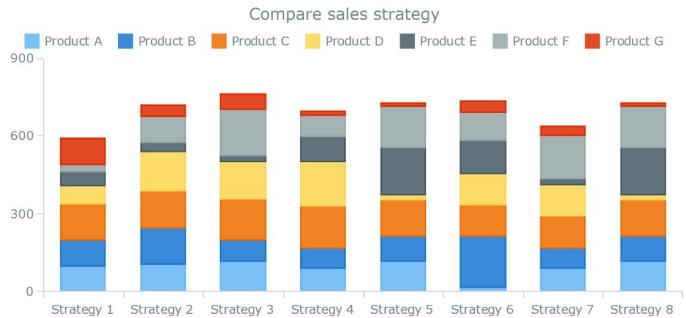
Categorical (x-axis) + Numeric (y-axis)




Compare sales strategy
Product A
Product B
Product C
Product D
Product E
Product F
Product G
900
600
300
0
Strategy 1
Strategy 2
Strategy 3
Strategy 4
Strategy 5
Strategy 6
Strategy 7
Strategy 8

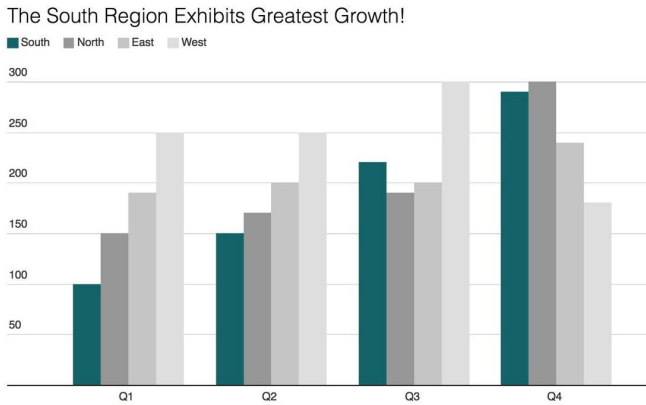
Stacked Bar Chart

- Good for proportions, parts to a whole, comparisons
  - Shows sub-category composition within each main category.
- **Limitation(s):**
  - Harder to read the more segments each bar has.
  - Comparing segments to each other is difficult, as they're not aligned on a common baseline.
- **Data type:**
  - Categorical with grouped sub-categories

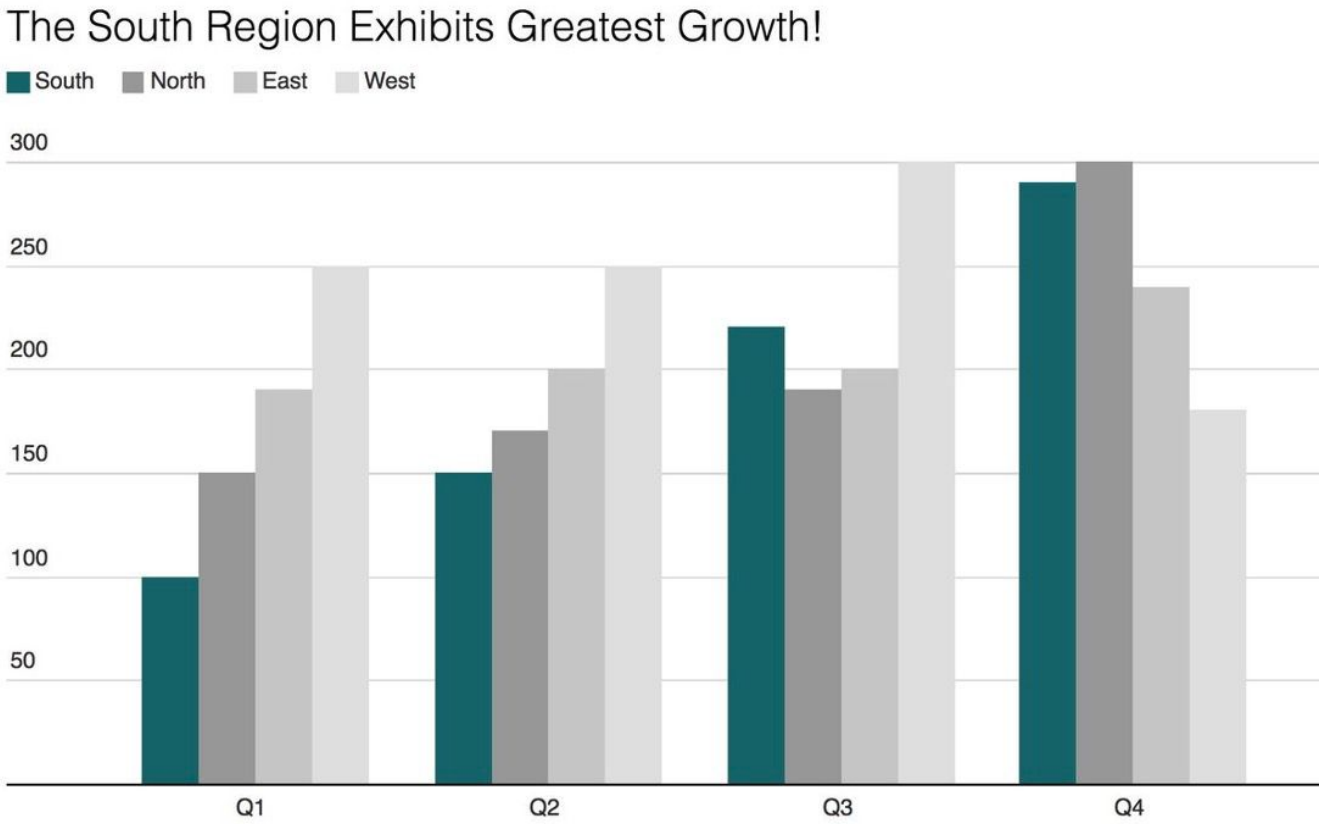


Multi-Set or Grouped Bar Chart

- Good for distribution, relationships and comparisons
  - Easier than stacked bar for subgroup comparison
- **Limitation(s):**
  - Becomes unreadable with too many groups
- **Data type:**
  - Categorical (grouping + sub-grouping)



Multi-Set or Grouped Bar Chart



Pie Chart

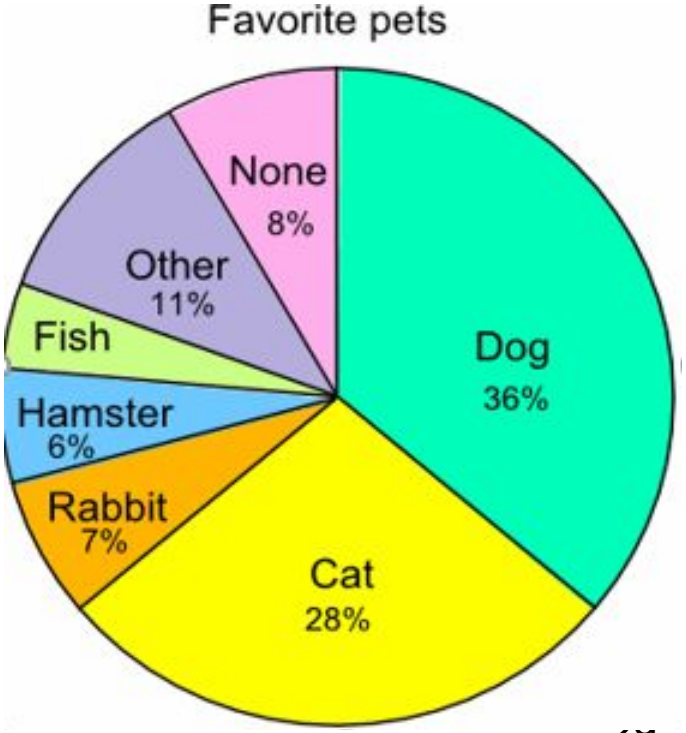
- Show part-to-whole relationships
  - Quick visual impression of proportions

Limitation(s):

- Poor for precise comparison
- Difficult to read with more than ~5 slices

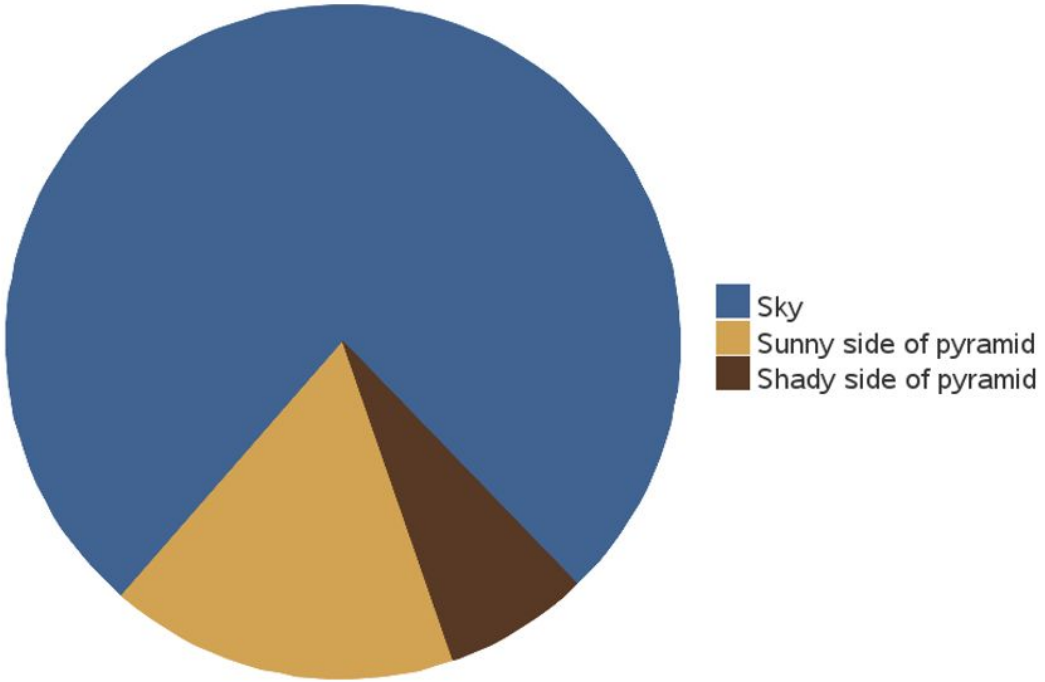
Data type:

- Categorical (each slice), numerical (size)



When is a good time to use a pie chart?

- The short answer is only in very rare occasions.
- Ideally in interactive situations or if you're looking to see if exactly two things are equal. E.g.



Q: Which visual cue do bar charts use to encode data

iClicker

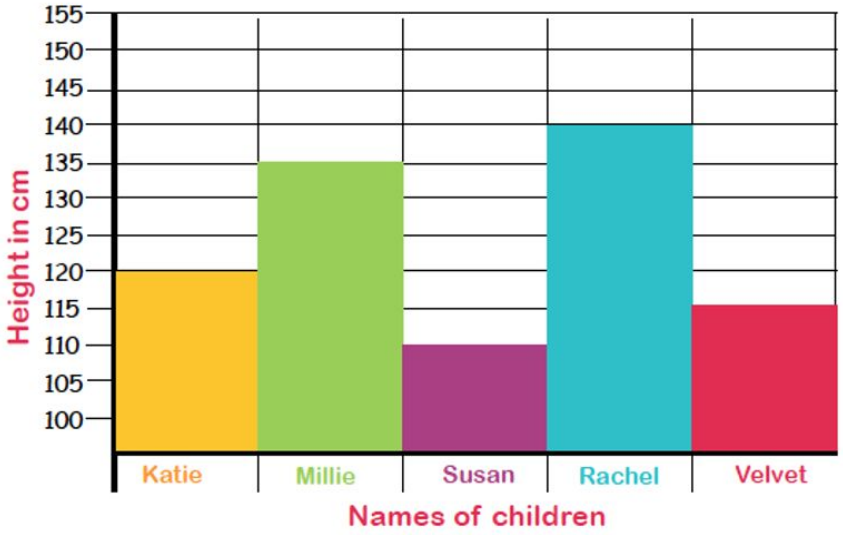
A. Position common scale

B. Position non-aligned scales

C. Length

D. Direction

E. Area



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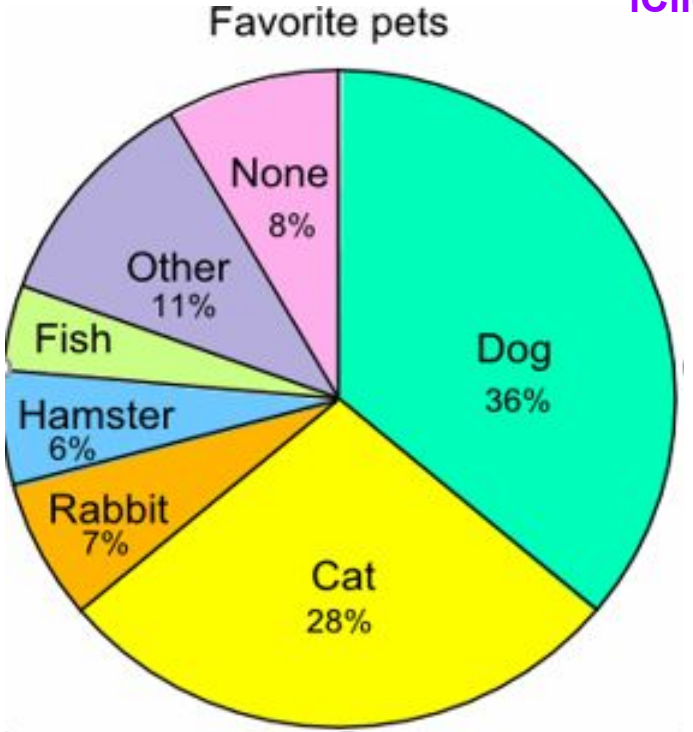

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  - Pie Chart
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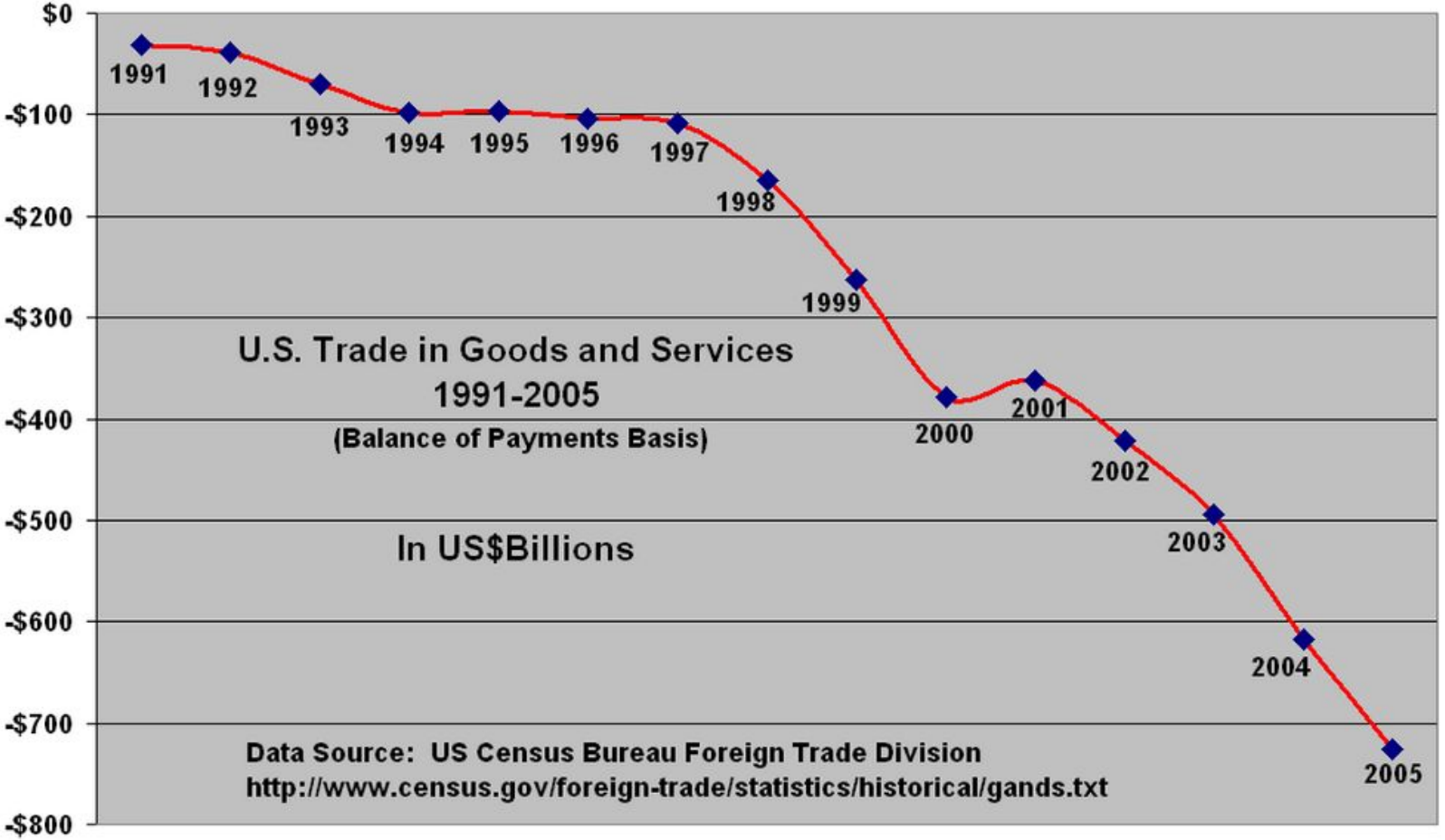
  - Tree Maps, Scatterplots, Tree Diagrams, Network Graph

Line Chart/Graph

- Show trends over continuous intervals (e.g., months, years)
  - Good for spotting increases/decreases over time

Limitation(s): Doesn't work well for categorical or sparse time points

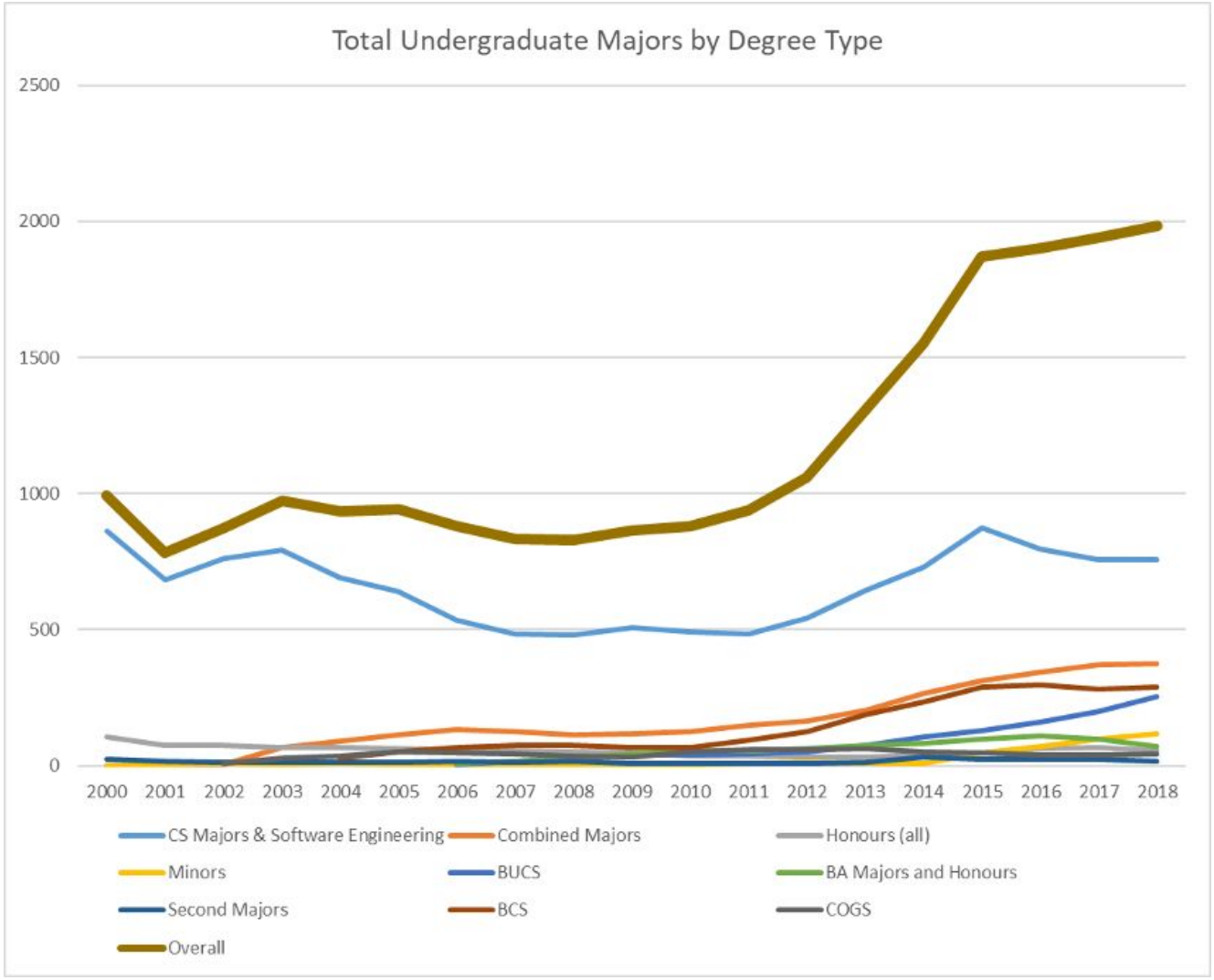

$0
-$100
-$200
-$300
-$400
-$500
-$600
-$700
-$800
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
U.S. Trade in Goods and Services
1991-2005
(Balance of Payments Basis)
In US$Billions
Data Source: US Census Bureau Foreign Trade Division
http://www.census.gov/foreign-trade/statistics/historical/gands.txt

Multi-Line Chart

- Compare multiple trends simultaneously
  - Highlights similarities or differences across groups

Limitation(s):

- Colour/label clutter with more than 4–5 lines


Total Undergraduate Majors by Degree Type
2500
2000
1500
1000
500
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
CS Majors & Software Engineering
Combined Majors
Honours (all)
Minors
BUCS
BA Majors and Honours
Second Majors
BCS
COGS
Overall

Area Chart

- Show cumulative change or volume over time
  - Visual emphasis on totals and growth

Limitation(s): Overlapping areas can obscure individual trends

- Can be misleading if baseline isn't zero

Data type:

- Time series, numeric

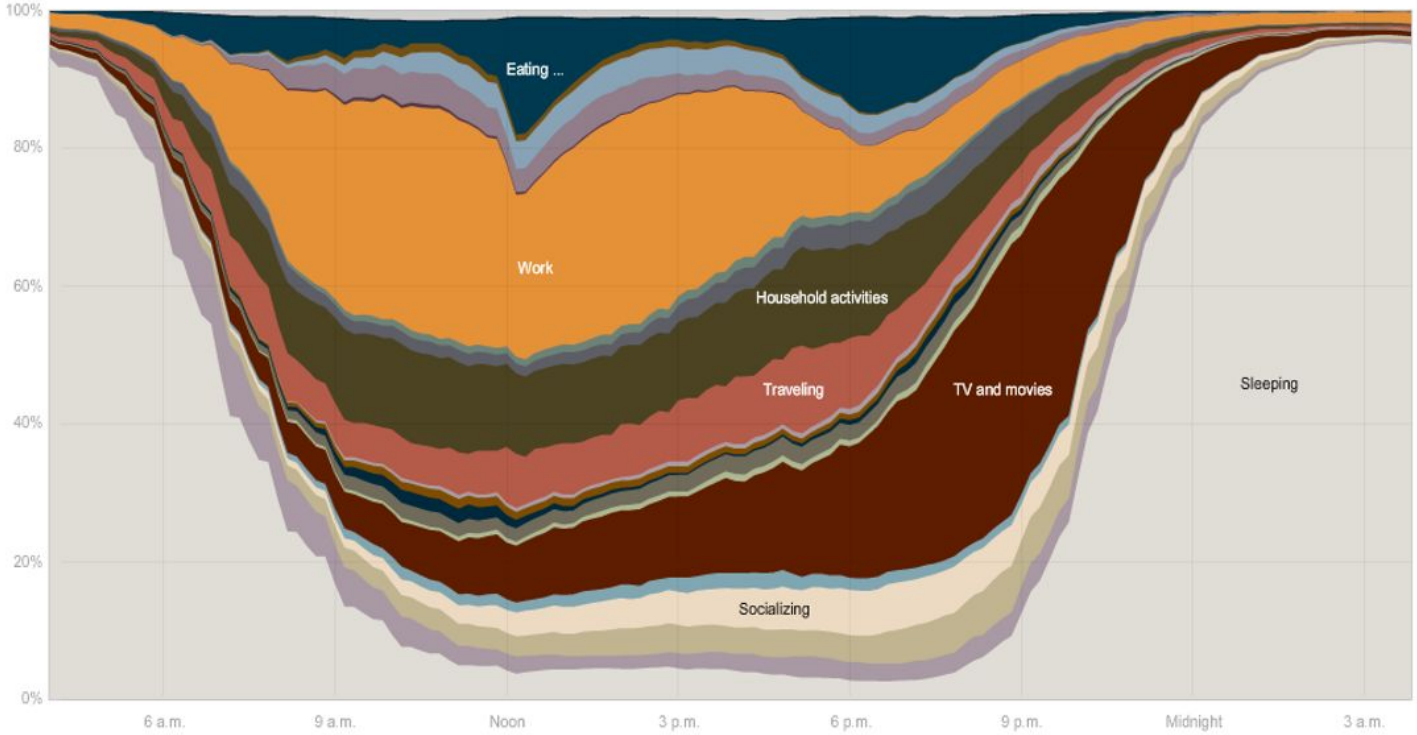
How Different Groups Spend Their Day

The American Time Use Survey asks thousands of American residents to recall every minute of a day. Here is how people over age 15 spent their time in 2008. Related article

Everyone

Sleeping, eating, working and watching television take up about two-thirds of the average day.

Everyone	Employed	White	Age 15-24	H.S. grads	No children
Men	Unemployed	Black	Age 25-64	Bachelor's	One child
Women	Not in lab...	Hispanic	Age 65+	Advanced	Two+ children



By SHAN CARTER, AMANDA COX, KEVIN QUEALY and AMY SCHOENFELD | Send Feedback

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  - Tree Maps, Scatterplots, Tree Diagrams, Network Graph

Radar Chart (Spider Chart)

- Profile comparison across multiple attributes (e.g., performance metrics)
  - Great for showing shape or balance of characteristics

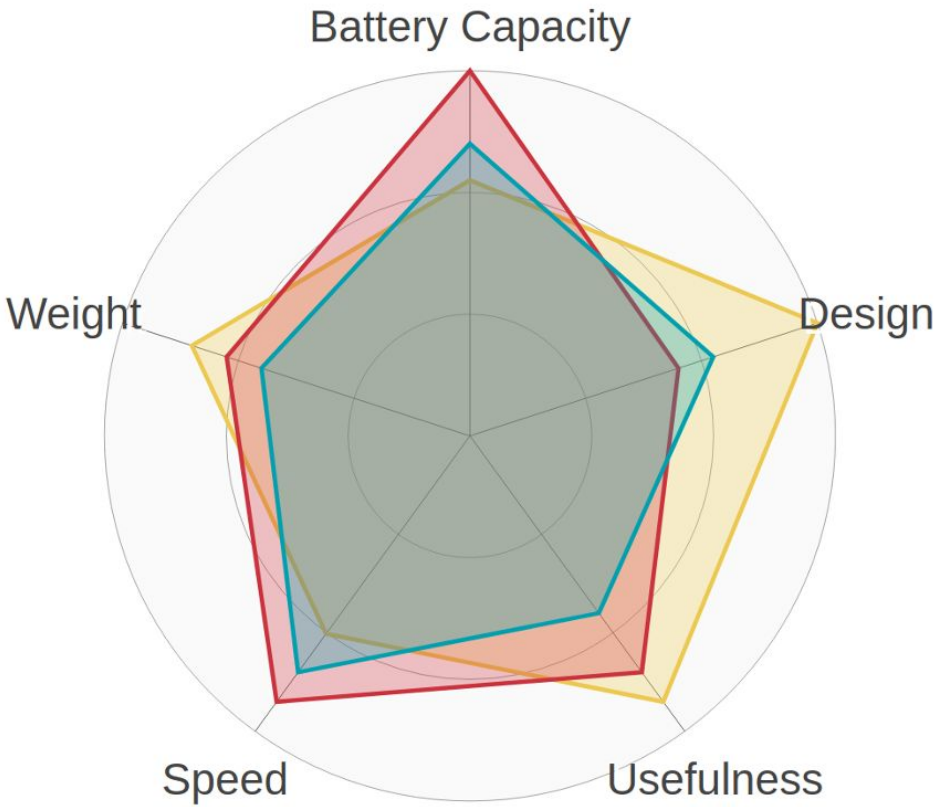
Limitation(s):

- Difficult to interpret beyond 5–7 axes
- Angles can distort perception

Data type:

- Multivariate (many numeric dimensions per category)

Radar Chart (Spider Chart)



Bubble Chart

- Show 3 variables in one chart (x, y, and bubble size)
  - Captures correlation and scale

Limitation(s):

- Bubble size often misinterpreted (area vs. radius)
- Overlapping bubbles obscure meaning

Data type:

- Quantitative x, y, and magnitude

Bubble Chart

Parallel Coordinates

- Visualize high-dimensional numerical data
  - Detect patterns, clusters, and outliers

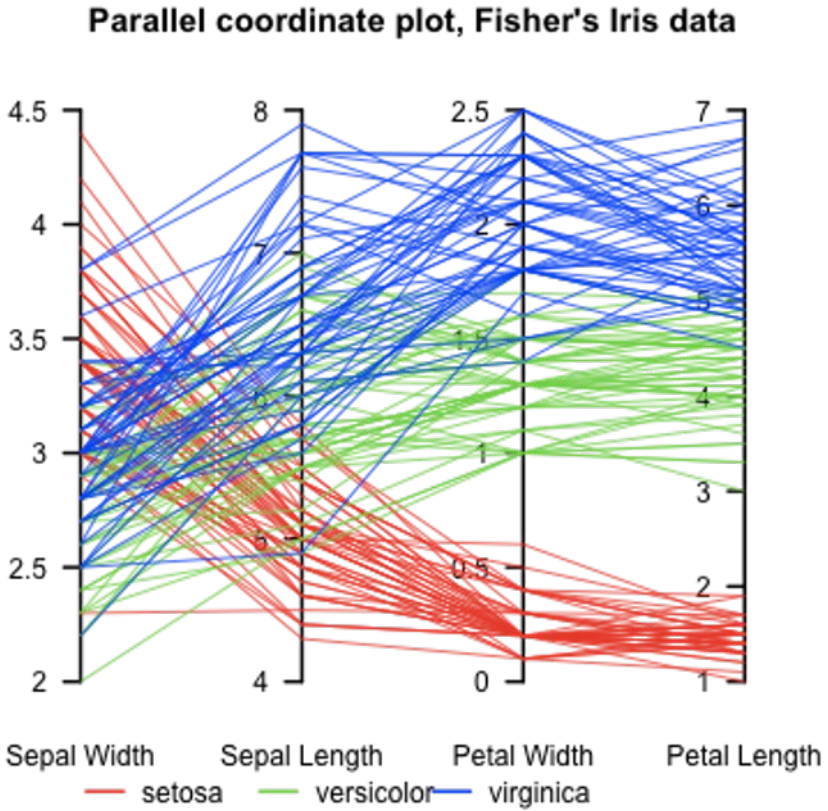
Limitation(s):

- Steep learning curve for novices
- Overplotting with many records

Data type:

- Multivariate numerical

Parallel Coordinates



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Tree Map

- Represent hierarchical parts-of-a-whole using nested rectangles
  - Space-efficient and good for proportional data

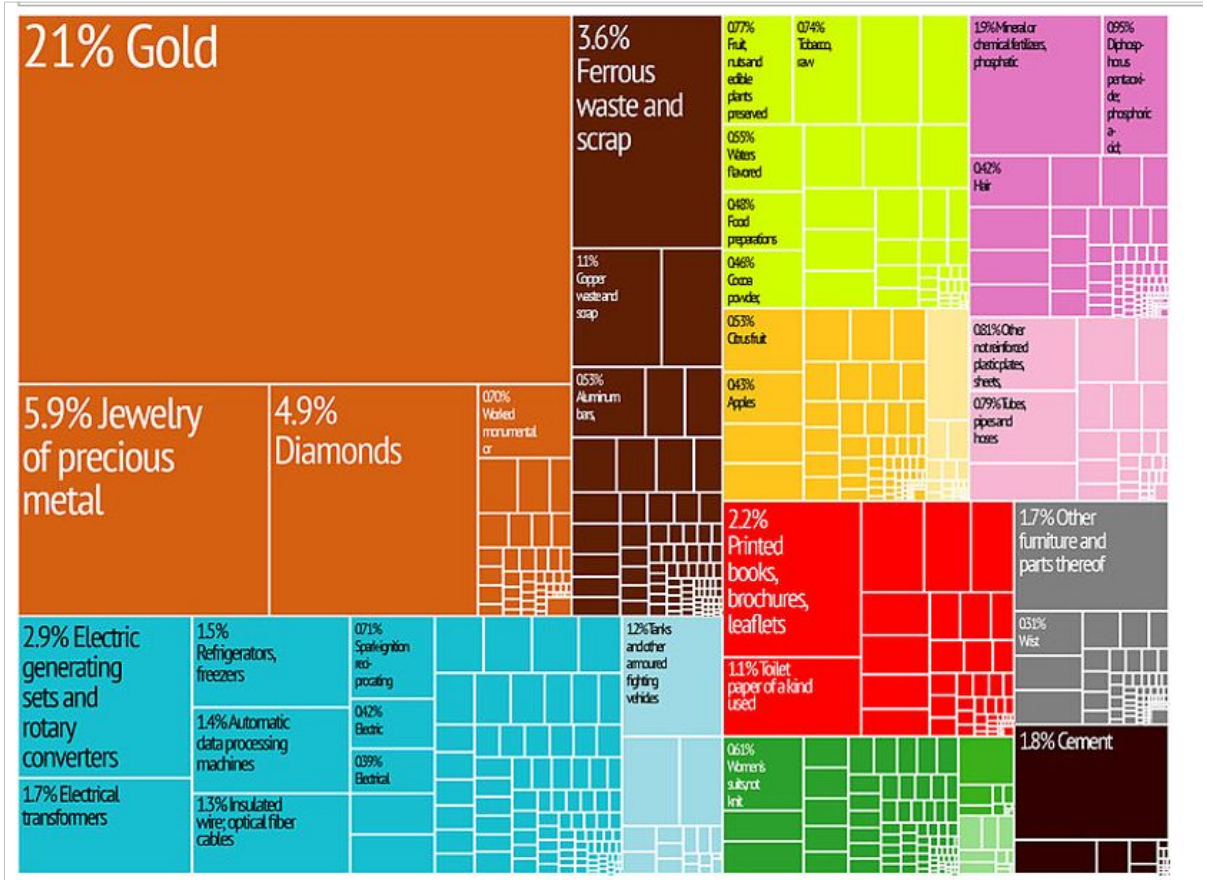
Limitation(s):

- Hard to compare small segments
- Poor for deep hierarchies

Data type:

- Hierarchical categorical + numerical

Tree Map


21% Gold
3.6% Ferrous waste and scrap
5.9% Jewelry of precious metal
4.9% Diamonds
2.9% Electric generating sets and rotary converters
1.5% Refrigerators, freezers
1.4% Automatic data processing machines
1.3% Insulated wire; optical fiber cables
1.7% Electrical transformers
1.2% Tanks and other armoured fighting vehicles
2.2% Printed books, brochures, leaflets
1.1% Toilet paper of a kind used
1.7% Other furniture and parts thereof
1.8% Cement

Scatterplot

- Show relationships between two quantitative variables
  - Reveals correlation, clusters, and outliers

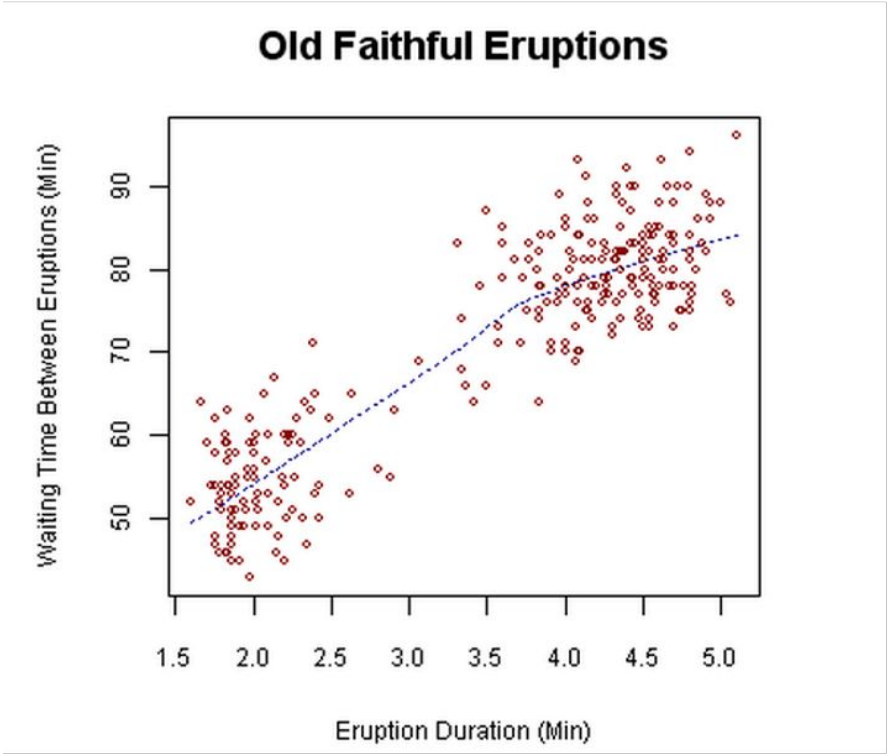
Limitation(s):

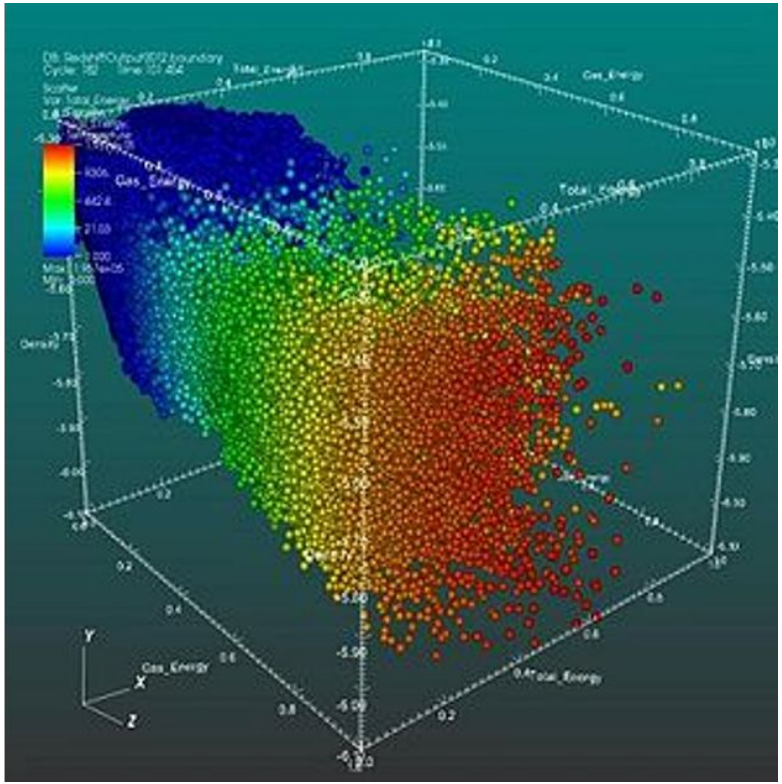
- Can’t handle more than 2–3 variables without color/size

Data type:

- Quantitative x and y

Scatterplot





Network Graph

- Display relationships between entities (e.g., social networks, citations)
  - Highlights central nodes, connectivity

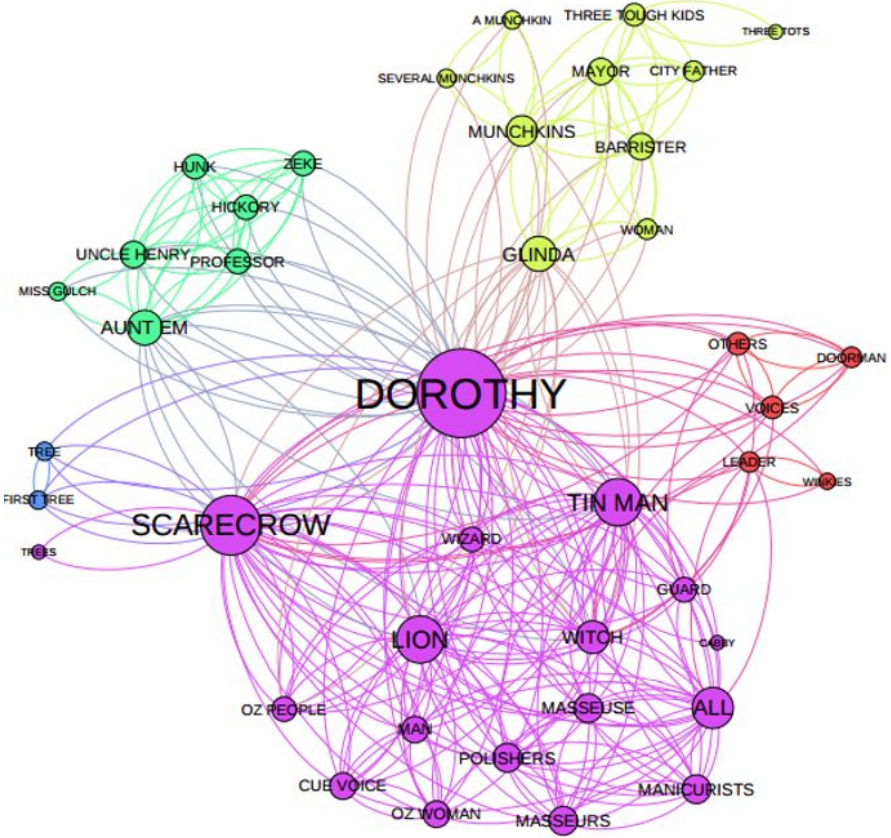
Limitation(s):

- Layout heavily affects readability
- Dense networks require interactivity

Data type:

- Nodes + edges (categorical and/or weighted)

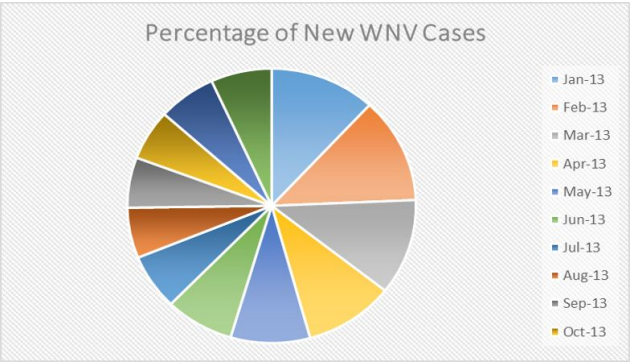
Network Graph



Representation Effect

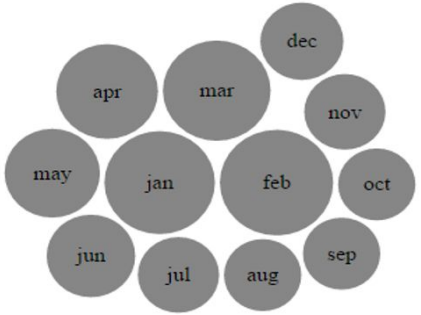
Q: Which visualization is best suited to answer the question, which month had the highest percentage of new cases?

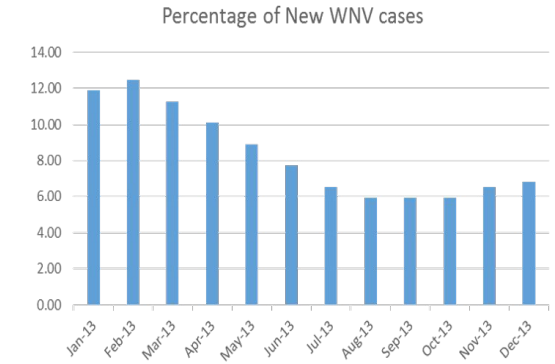
iClicker



A

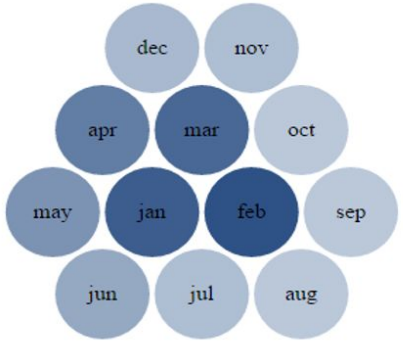
C





B

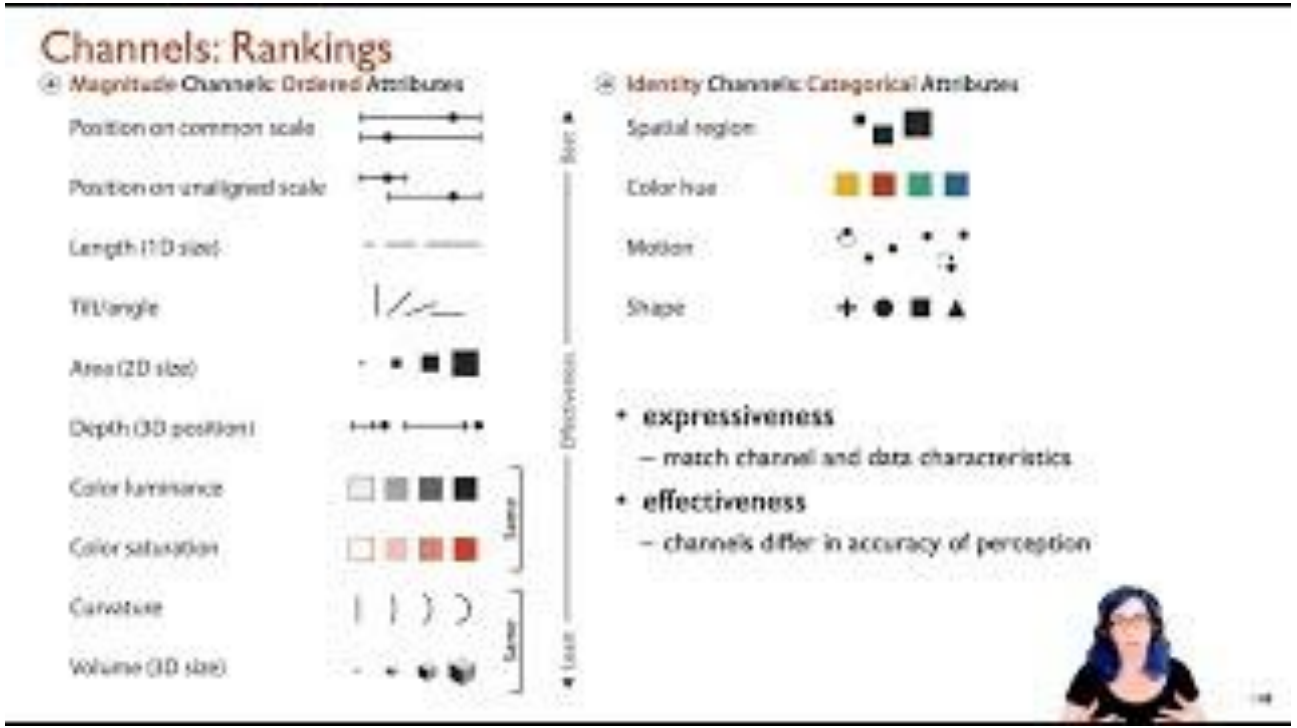
D



Take Home Video

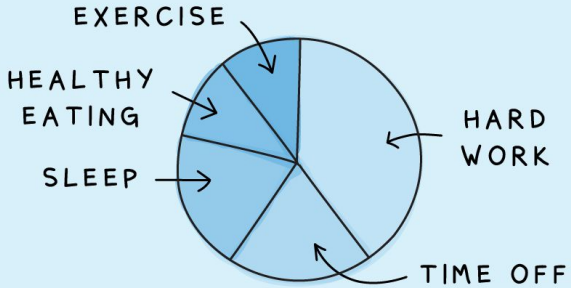
Visualization: Marks & Channels

https://youtu.be/xplSAMwlTmY?si=z7LTBvASdyPYKqVS



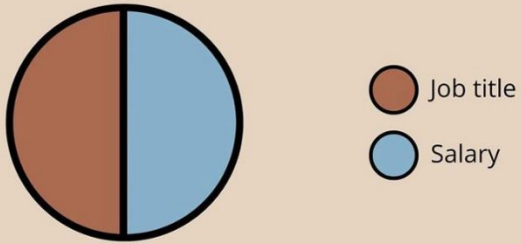
WHAT I THOUGHT WOULD MAKE ME PRODUCTIVE

WHAT ACTUALLY DOES

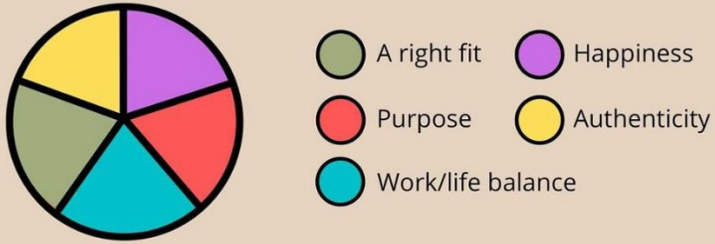


LIZ FOSSLIEN

HOW PEOPLE OFTEN MEASURE SUCCESS



HOW SUCCESS SHOULD BE MEASURED



@THEPRESENTPSYCHOLOGIST

What was your main takeaway from today's session?

Wrap up

Wrap Up

- **PC Quiz 6** *(don't leave this until Sunday!)*
  - Due Sunday, March 23, 11:59pm
- **Lab 7 Infographic Critique**
  - Due Friday, March 21, 11:59pm
- **Project Milestone 3** *(have you started yet?! If not, it's time to do so)*
  - Due Friday, April 7, 11:59pm
- **Final Exam**
  - Tuesday, April 22, 7pm; Location: SWING 121