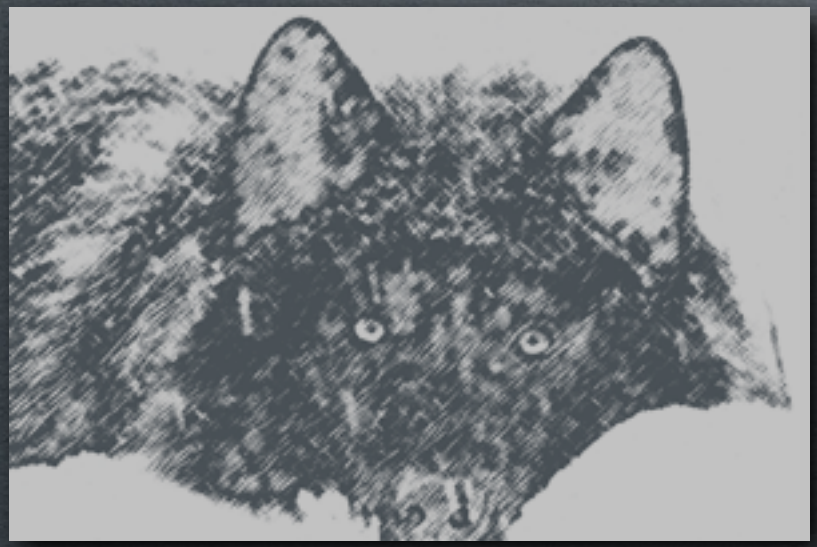
Guidelines on the Use of Graphs

IAA 2021

July 21, 2021



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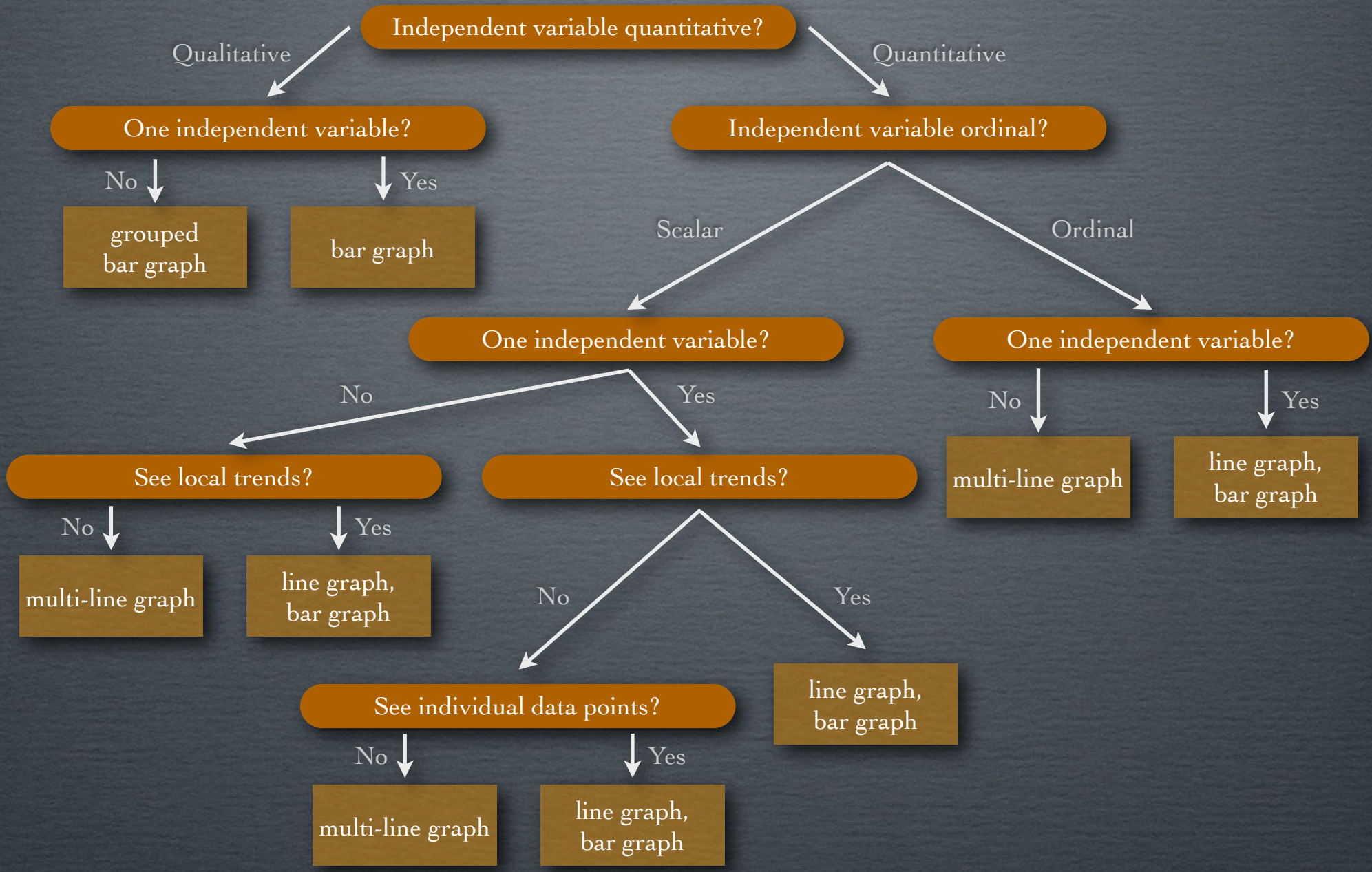
Charts and Graphs

- Well known, well recognized presentation technique
- Basic types of charts and graphs are recognized by most viewers
  - ✦ line graph, bar graph usually recognized
  - ✦ pie chart, histogram, scatterplot, Venn less common
- Different graphs are designed for different types of data and analysis tasks
  - ✦ import to choose the “correct” graph for the data and task
- Graphs are meant to *provide insight to your viewers*
- Understand your audience and their needs

Graph Types

- Different graphs are used for different tasks:
  - tracking changes (line graph)
  - correlations, relationships (X-Y plot)
  - correlations, clustering (scatterplot)
  - category comparison (bar chart)
  - distributions (pie chart)
  - uniqueness and overlap (Venn diagram)
- Graphs are not meant for absolute value determination
  - tables should be used if determining exact values is important
- Graph elements can represent multiple attribute values

Graph Selection



Define Target Audience

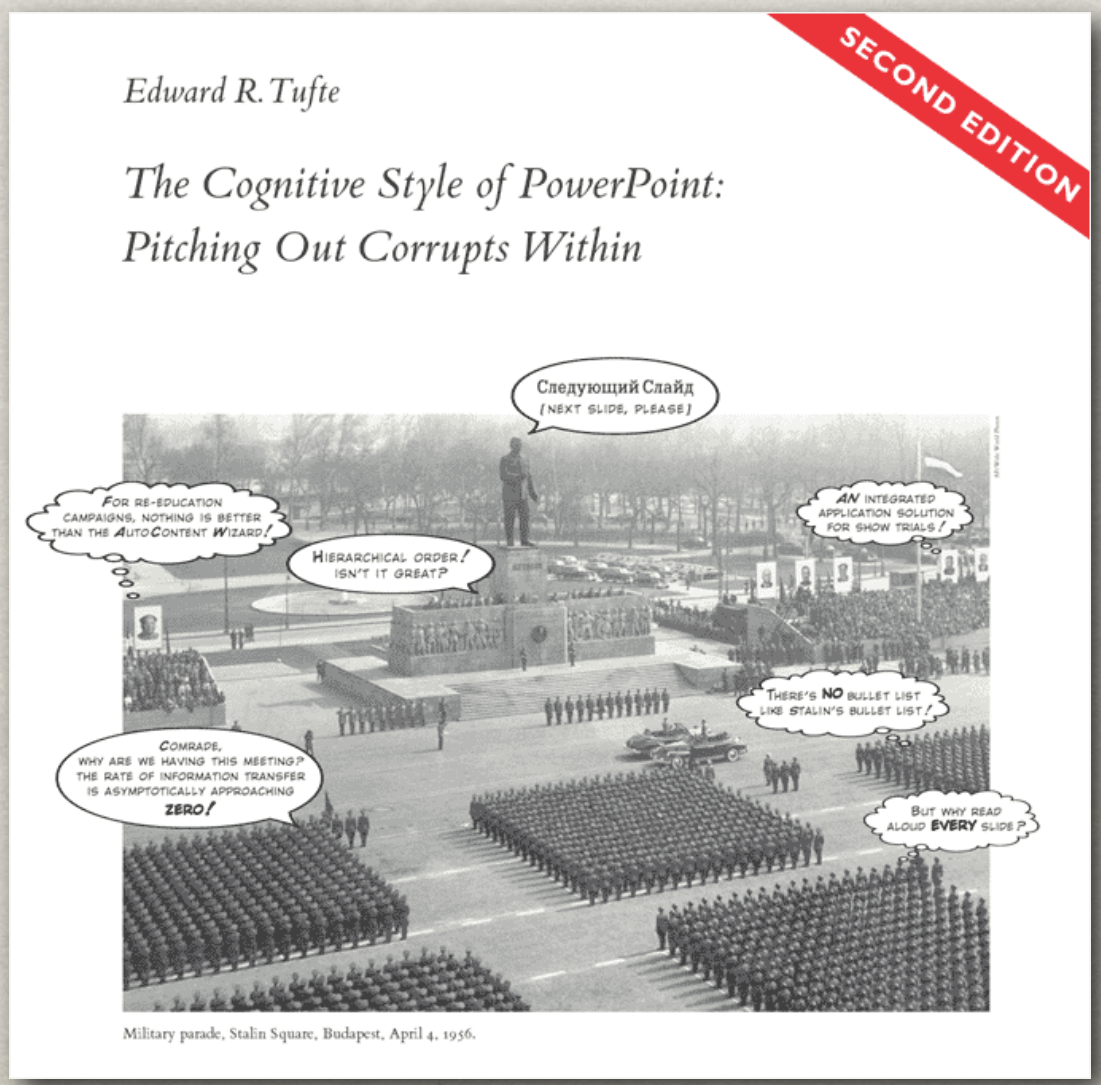
- Who is your target audience?
  - Defines the presentation type(s) they are familiar with
- What do they know about the data?
  - May want to include known data to define context
  - May want to leave out known data if its presentation is redundant
- What do they want to know about the data?
  - Defines which data to show, which presentation type(s) to use
- What do they expect to see?
  - Defines “uninteresting” results
- What will they do with the information?
  - e.g., exploring the data, validating known results, presenting results?
  - Defines which presentation type(s) to use

Define Message

- What do the data show?
  - Depends on analysis task(s) and result(s) found
  - Exploration, show new results
  - Validation, show that expected results are correct
  - Presentation, show important results in an easy-to-comprehend manner
- Is there more than one main message?
  - Ensure individual messages are clear and memorable
  - Do not use a single presentation for multiple messages unless necessary
- What aspects of the message should be highlighted?
  - Ensure main point(s) are obvious point in the presentation

Tufte's PowerPoint Folio

- Basic guidelines on computer presentation

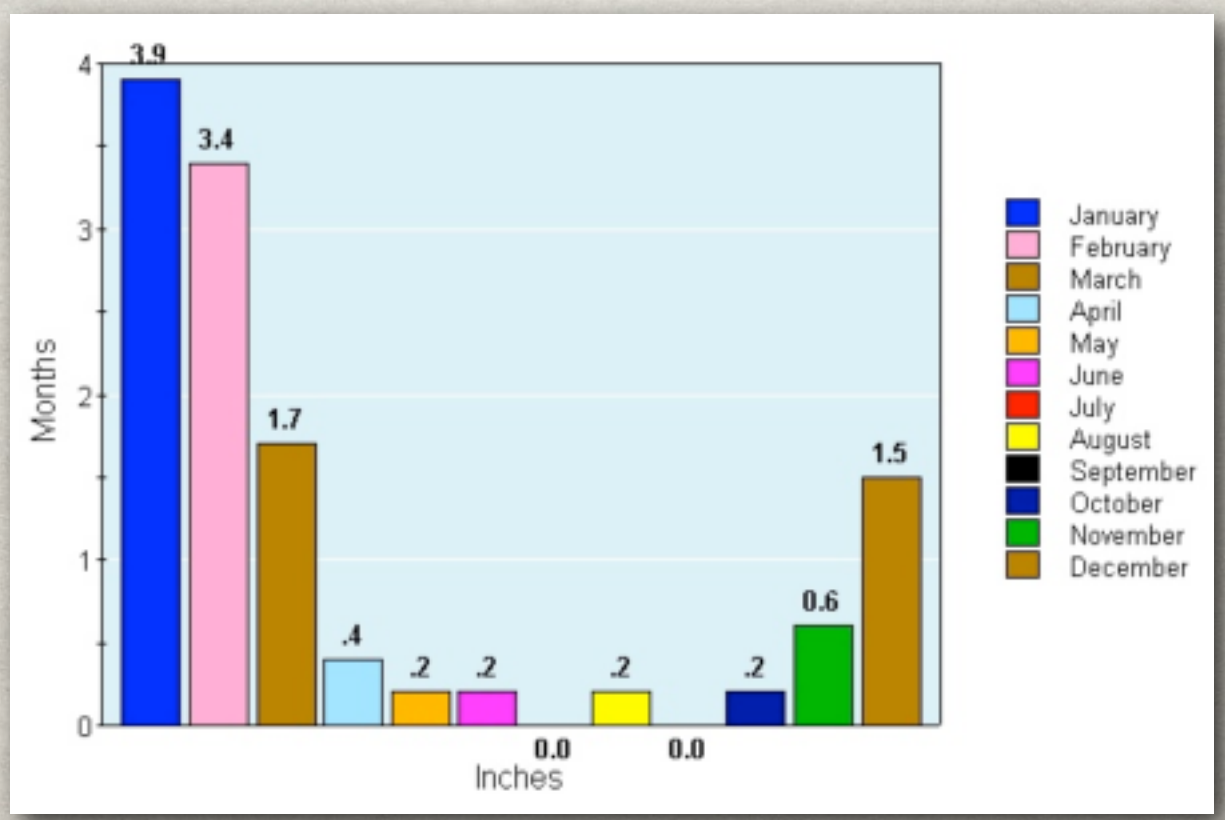


Graph Recommendations

- Pie chart
  - comparison of relative amounts, description of components
- Bar graph
  - comparison of items, relationships between items
  - time series data
- Line graph
  - time series and frequency distribution
- Scatterplot
  - analysis of relation
- Venn diagram
  - analysis of uniqueness and commonality (overlap)

Bar Graph

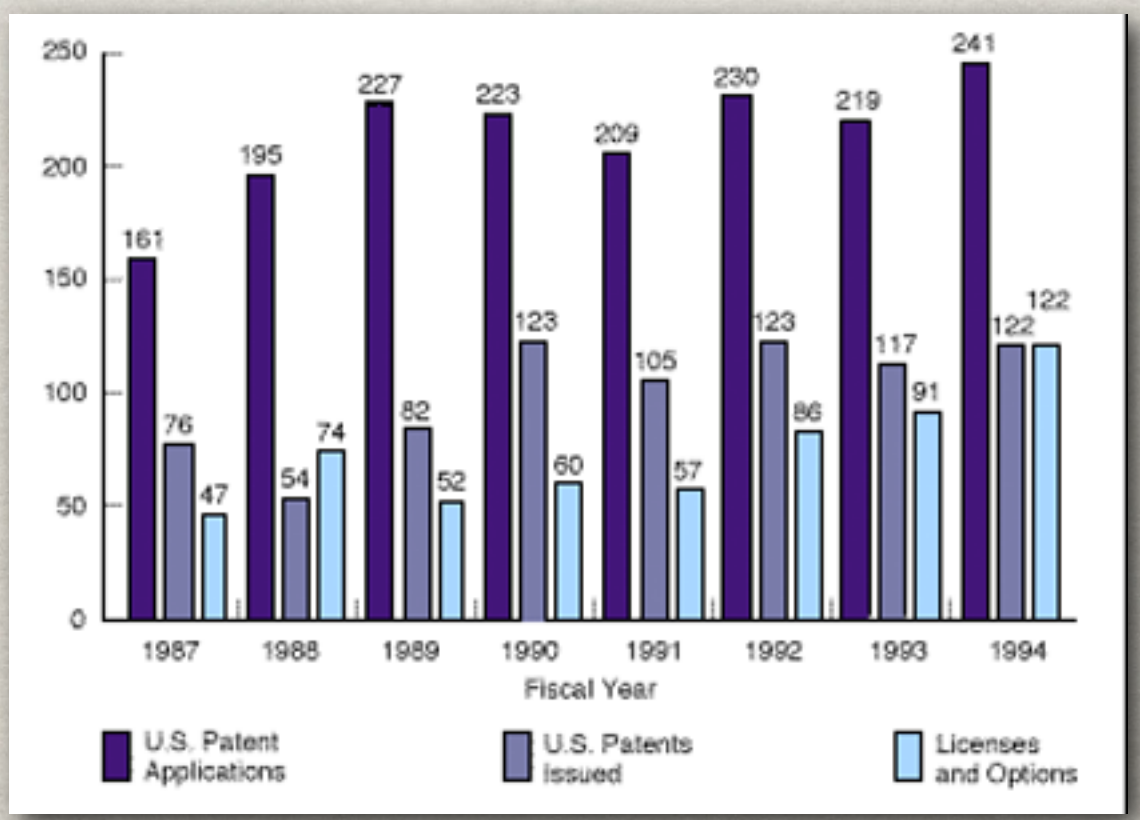
- Composed of discrete bars
- Represents categorical data for comparison across categories



Bar graph of ice, sleet, and snow in Knoxville, categorized by month

Bar Graph

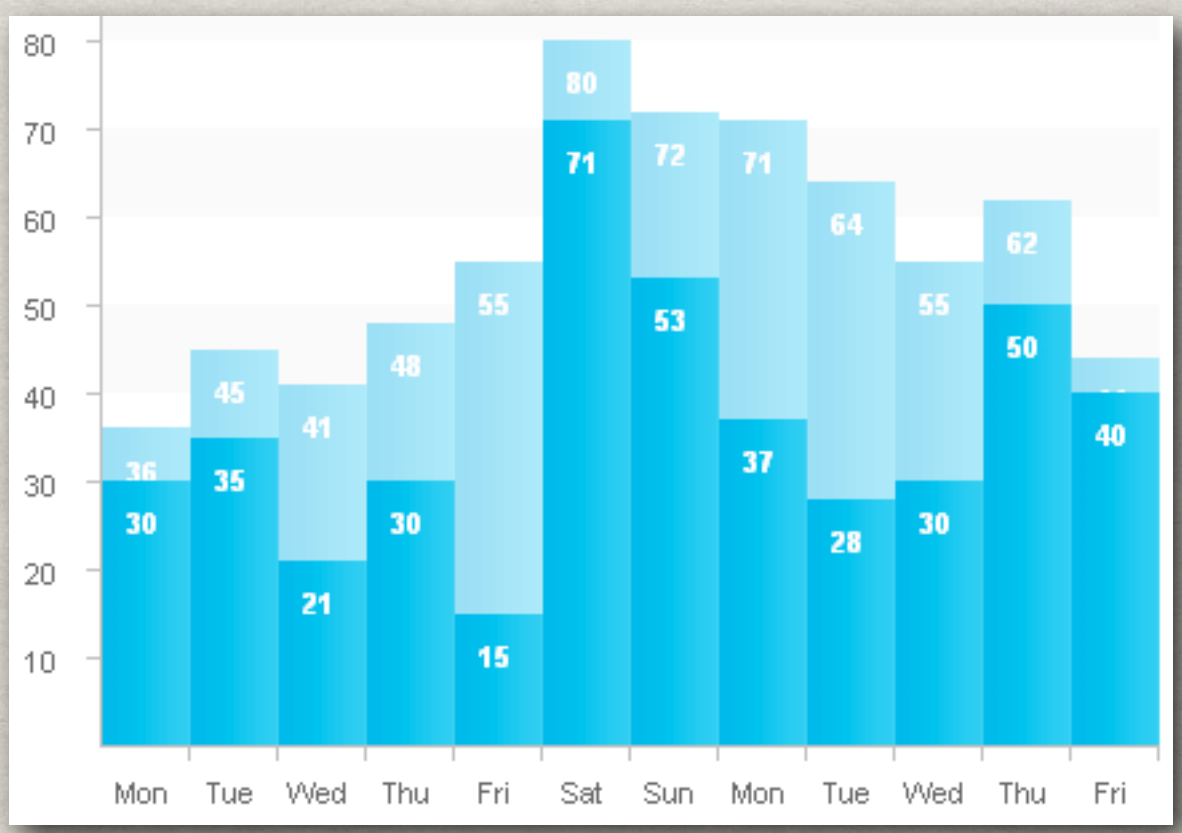
- Composed of discrete bars
- Represents categorical data for comparison across categories



Grouped bar graph of US patent applications, patents issued, licenses signed, categorized by year

Bar Graph

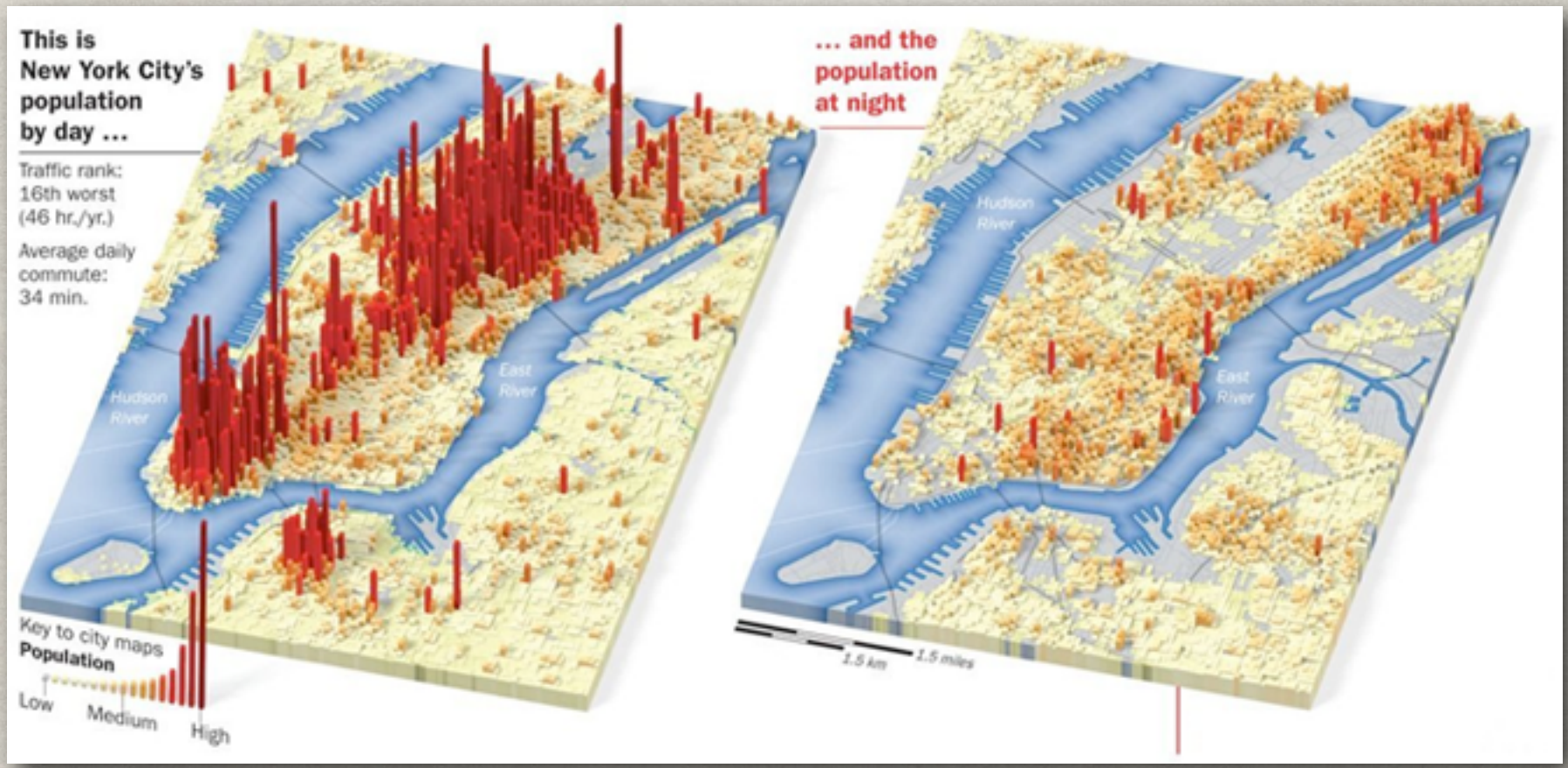
- Composed of discrete bars
- Represents categorical data for comparison across categories



Stacked or composite bar graph of production on two lines, categorized by day of week

Bar Graph

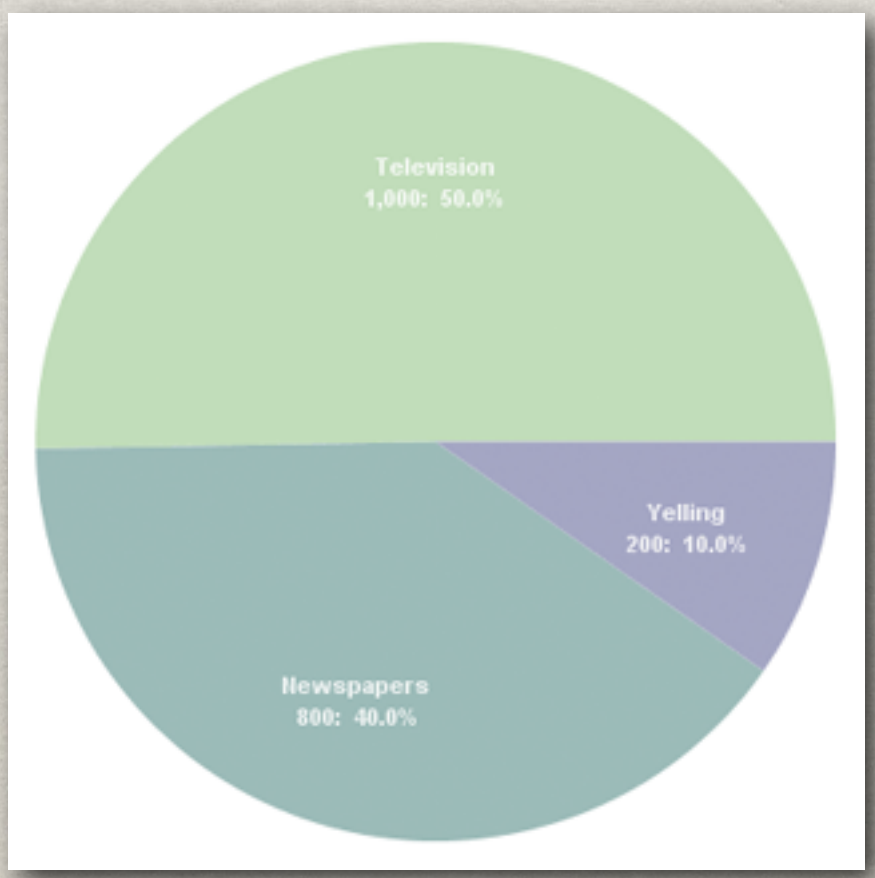
- Composed of discrete bars
- Represents categorical data for comparison across categories



Topographical bar chart of New York City population during the day, and at night

Pie Chart

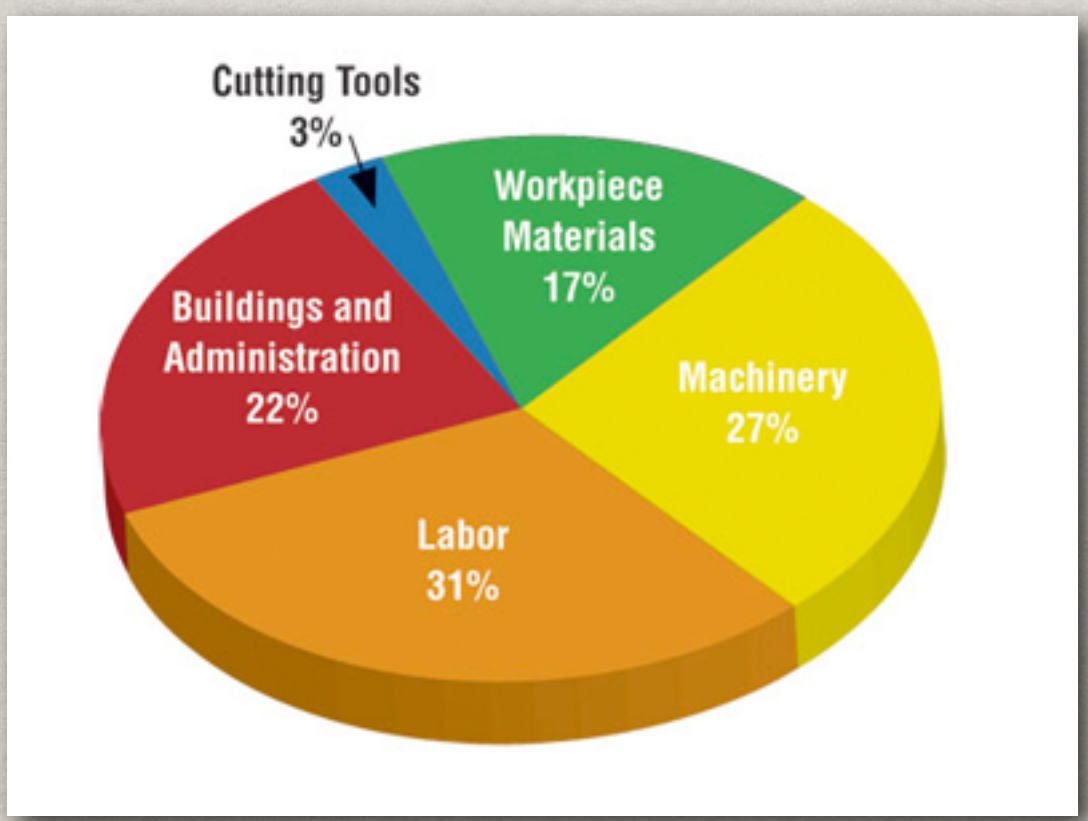
- Circular chart
- Relative comparison of amounts of parts of a whole



Pie chart of advertising dollars
categorized by media type

Pie Chart

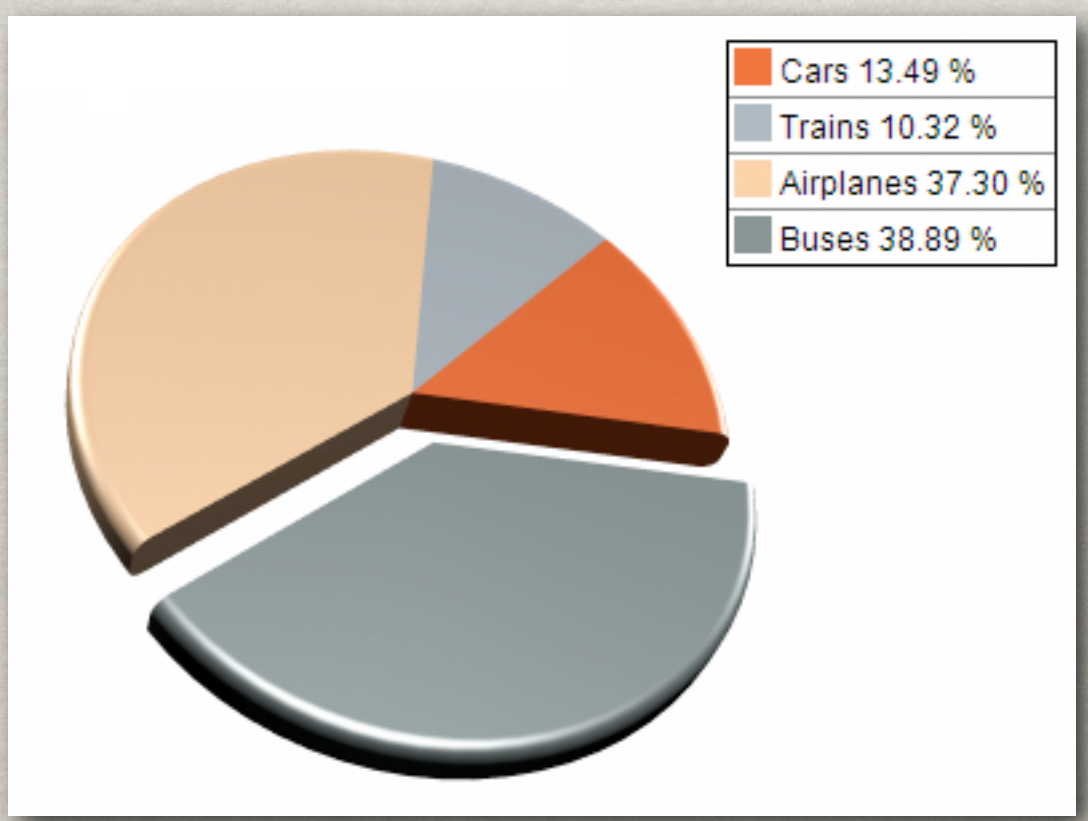
- Circular chart
- Relative comparison of amounts of parts of a whole



3D pie chart of expenditure costs,
categorized by expenditure type

Pie Chart

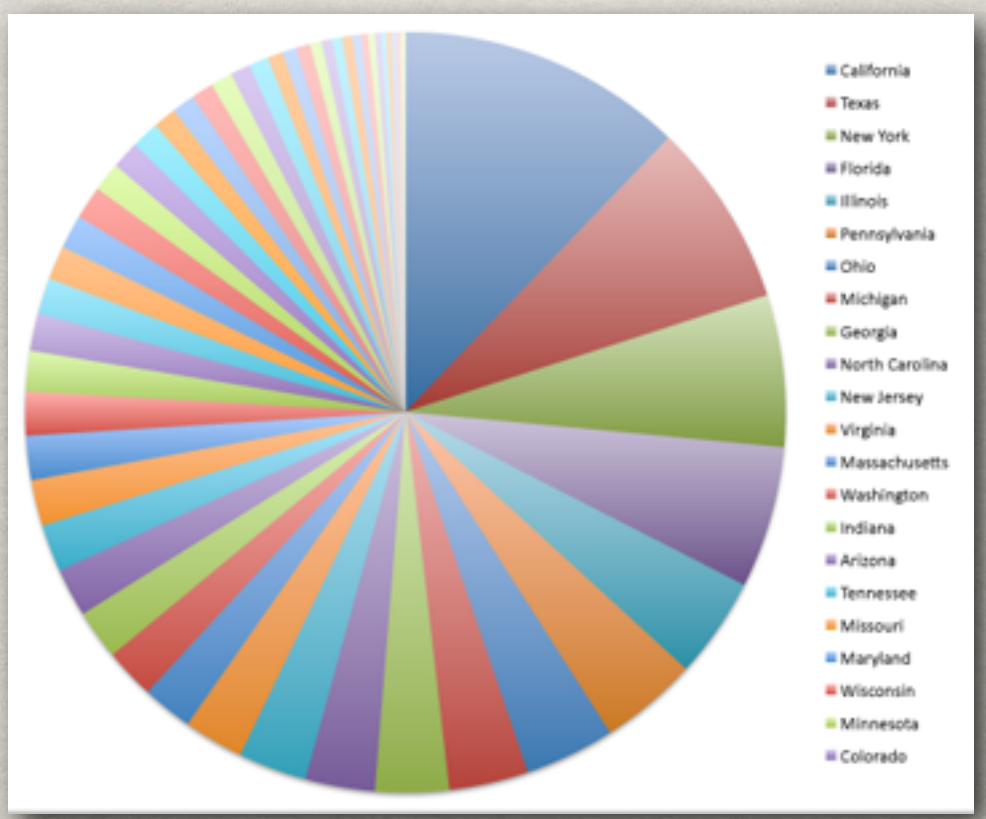
- Circular chart
- Relative comparison of amounts of parts of a whole



Exploded 3D pie chart of transportation use categorized by transportation type

Pie Chart

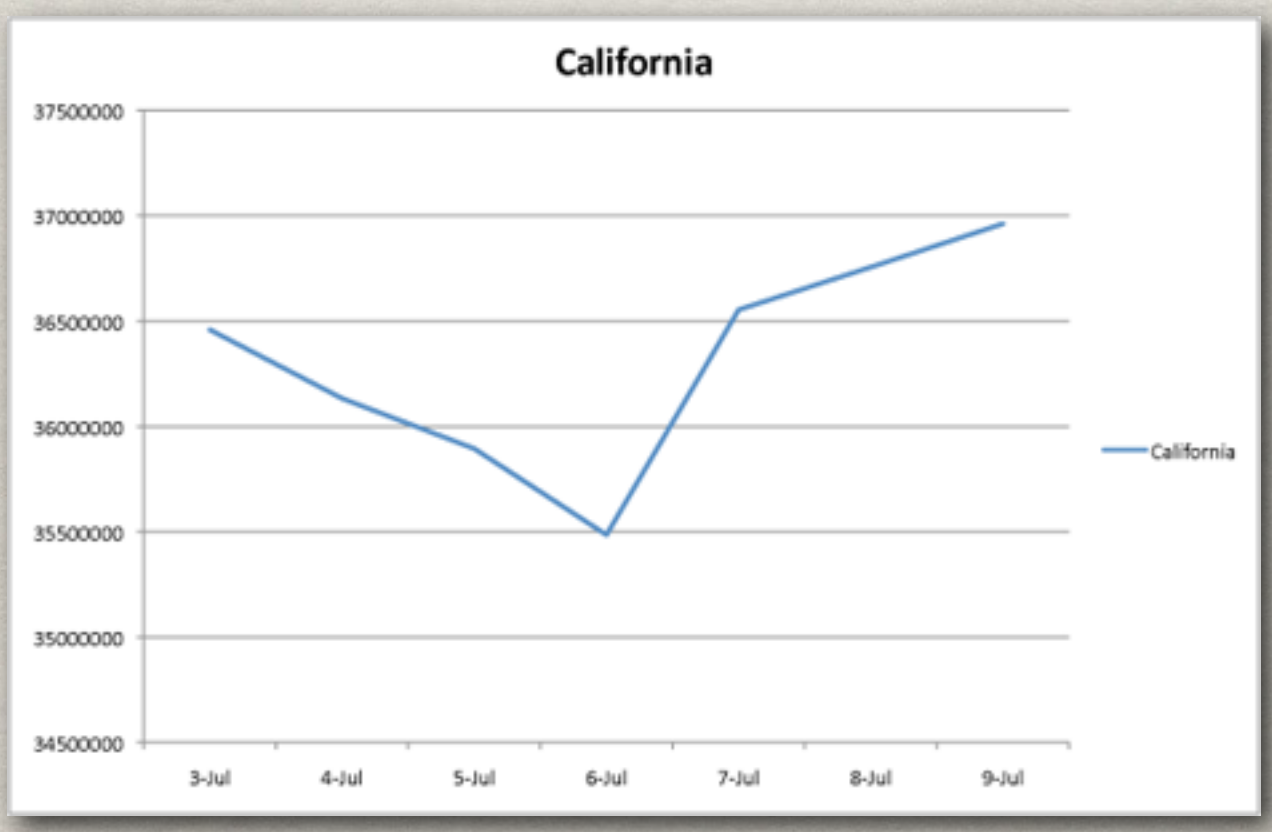
- Circular chart
- Relative comparison of amounts of parts of a whole



Pie chart of population by US state

Line Graph

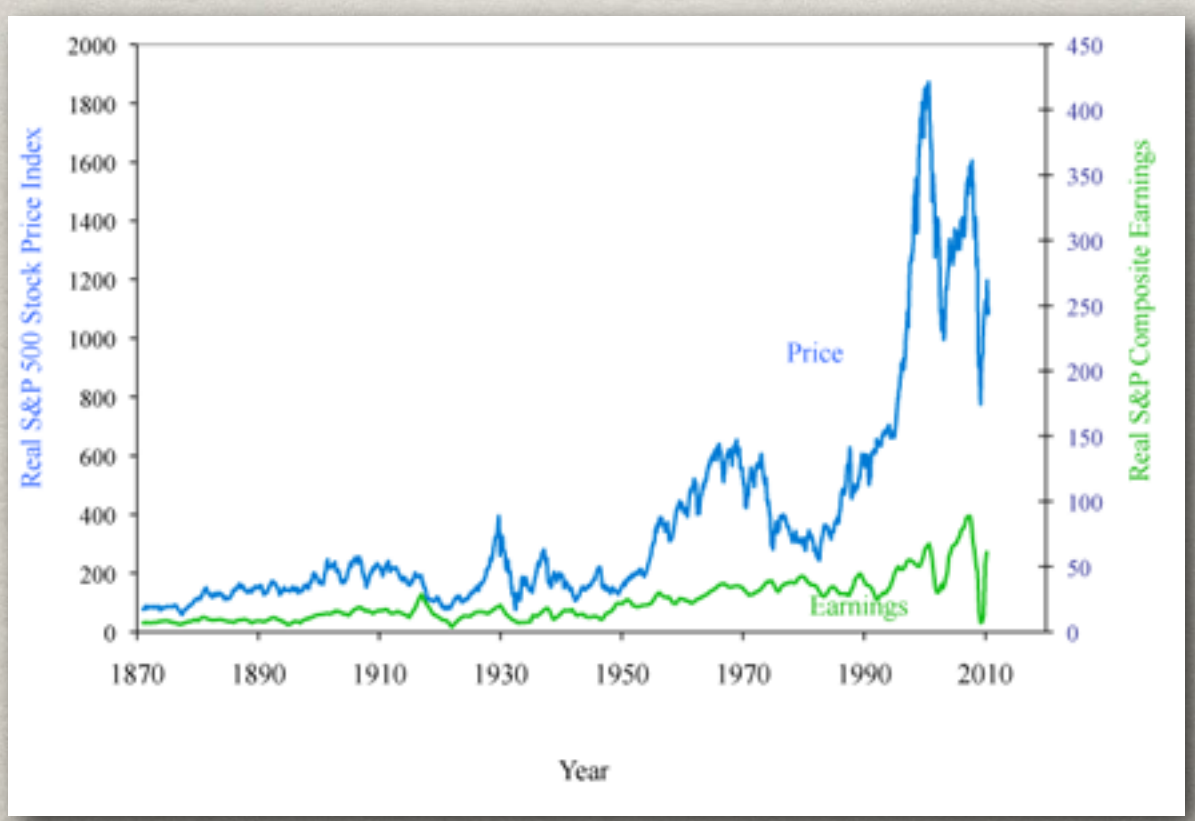
- Displays the relationship between two types of information
- Also useful for time-series trends



Line graph of California's population by year

Line Graph

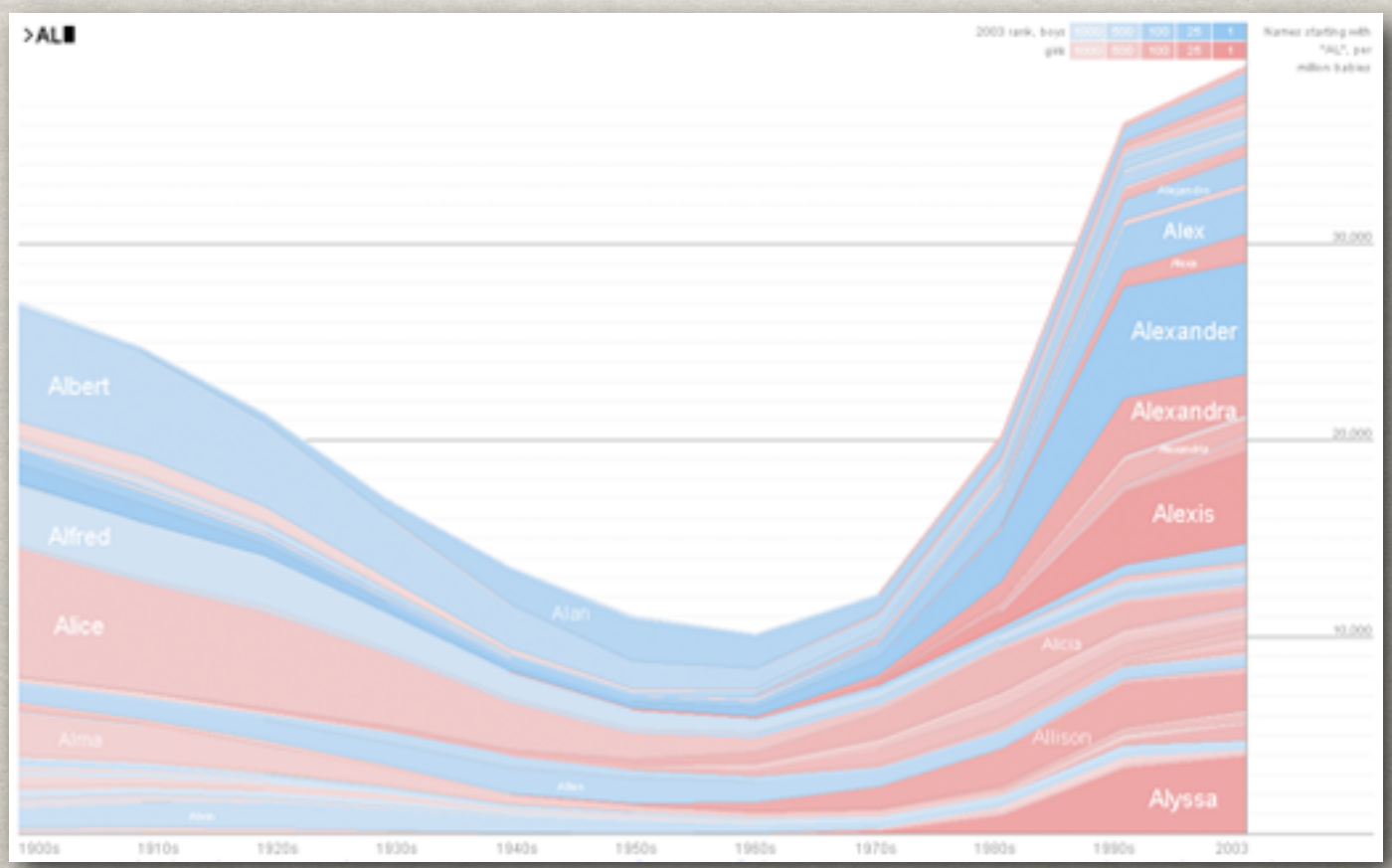
- Displays the relationship between two types of information
- Also useful for time-series trends



Time series line graphs of S&P 500
earnings versus price index from 1870–2010

Line Graph

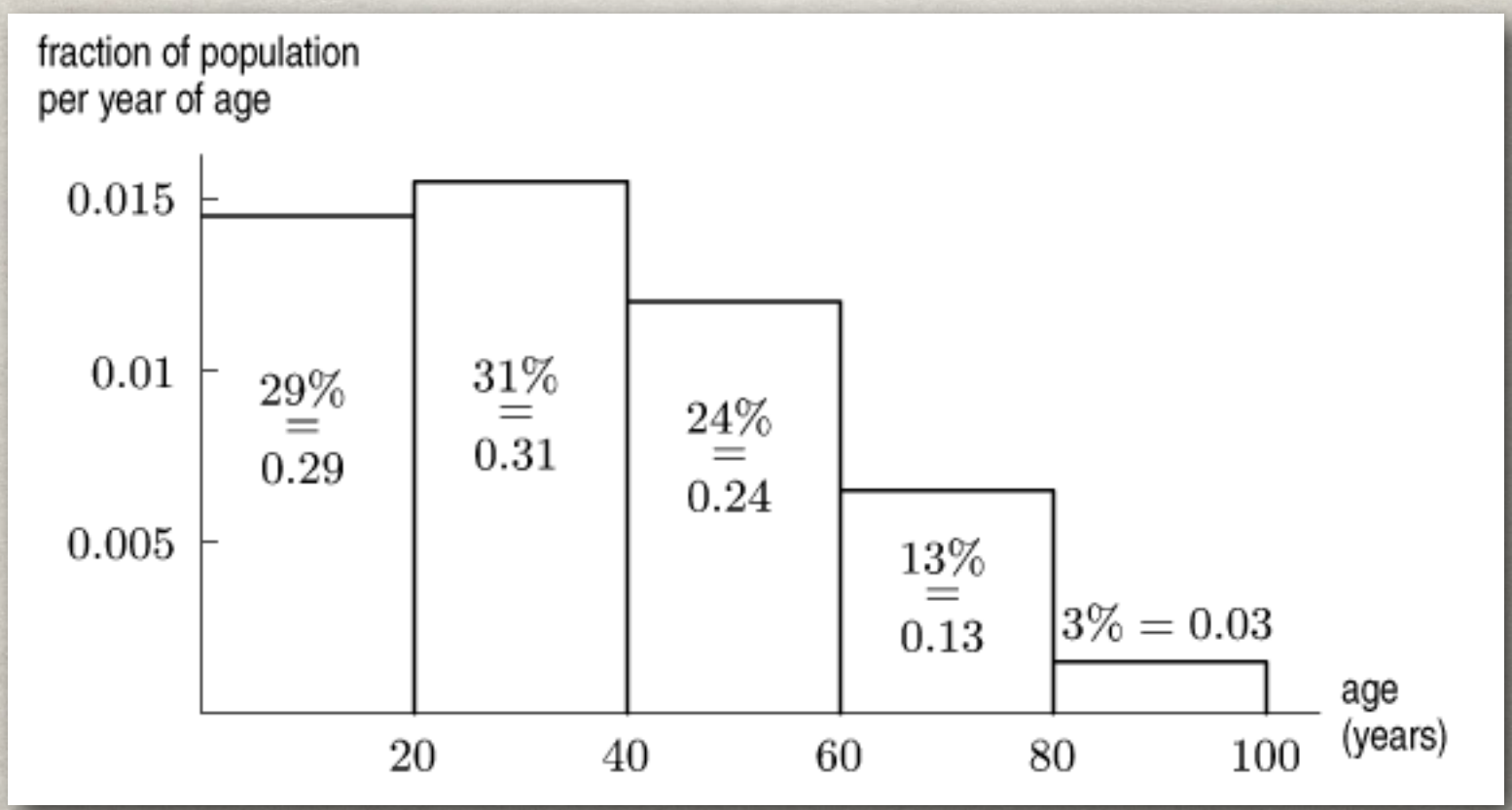
- Displays the relationship between two types of information
- Also useful for time-series trends



Stacked time series line graph of
baby name popularity from 1900–2003

Histogram

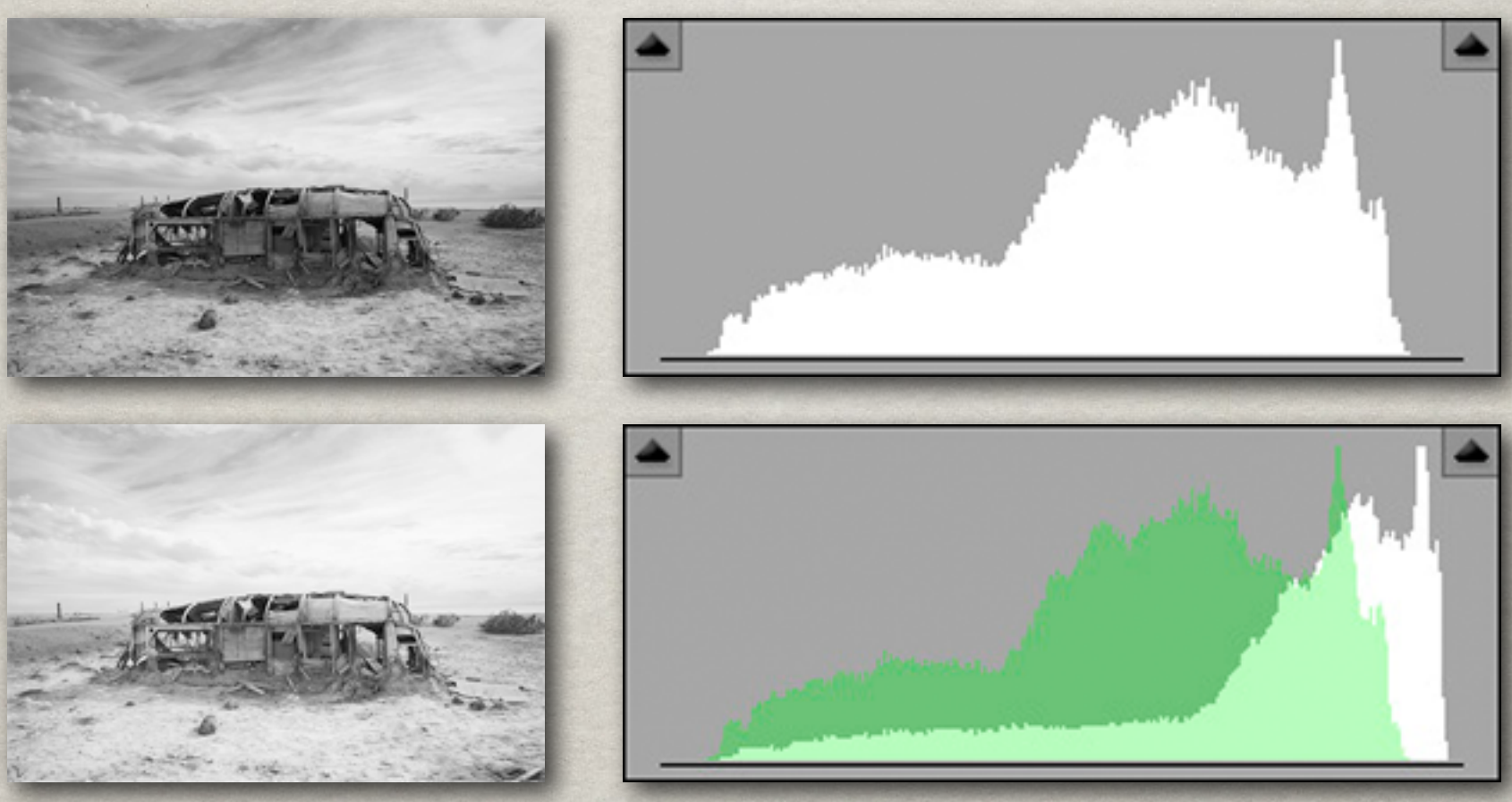
- Bars that display frequency of continuous data divided into interval “bins”



Histogram of population age
binned by age 20 year age intervals

Histogram

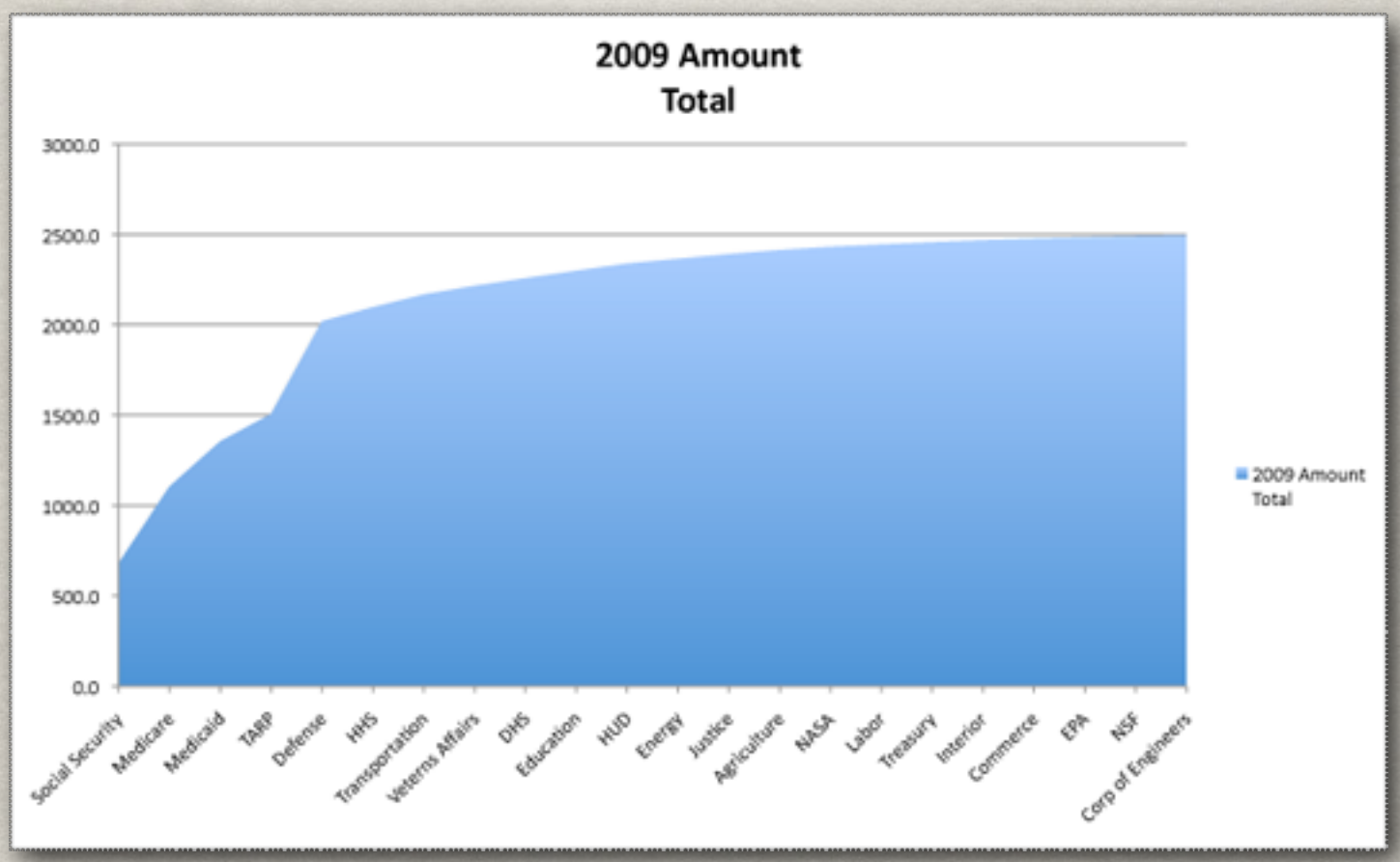
- Bars that display frequency of continuous data divided into interval “bins”



Interval histogram (with overlay for comparison)
of pixel brightnesses binned by greyscale

Histogram

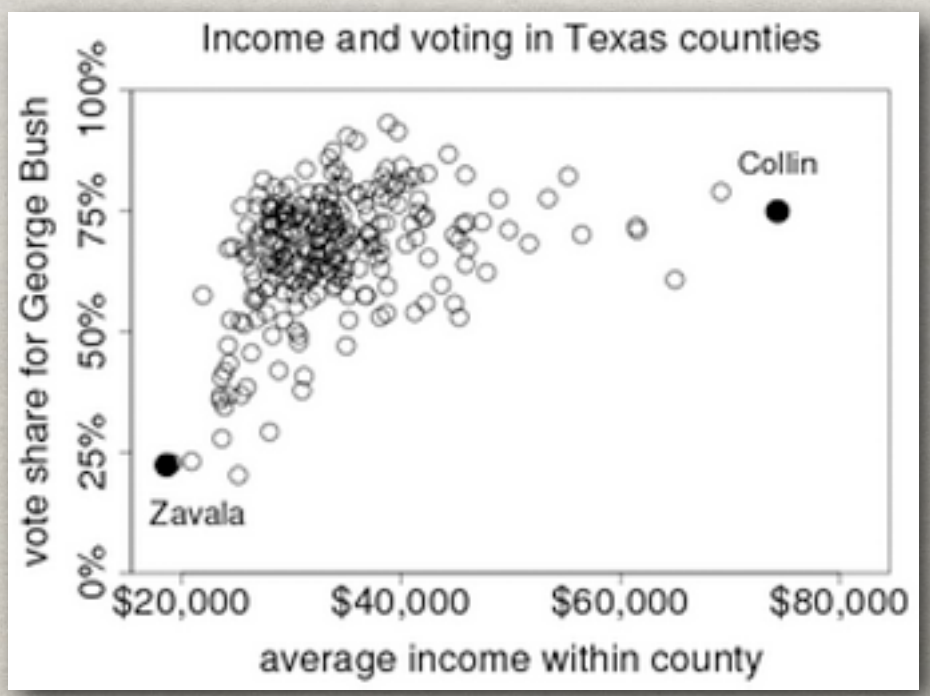
- Bars that display frequency of continuous data divided into interval “bins”



Cumulative histogram of federal spending
binned by agency

Scatterplot

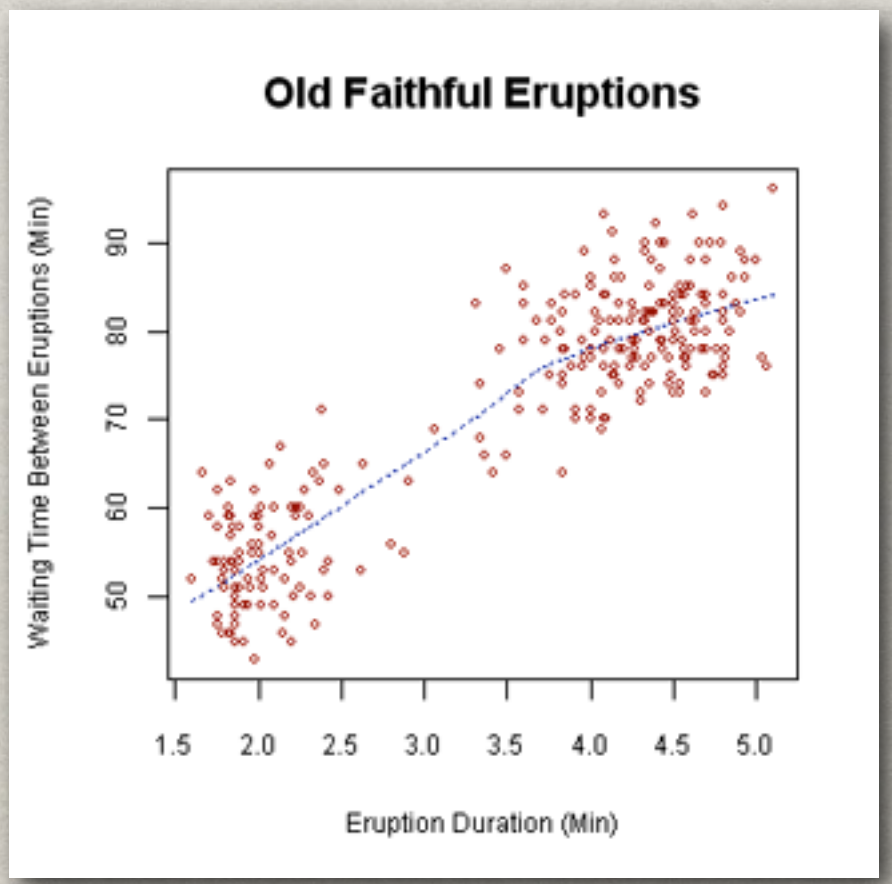
- Explore relationship between two variables



Scatterplot of county's average income versus vote percentage for George Bush

Scatterplot

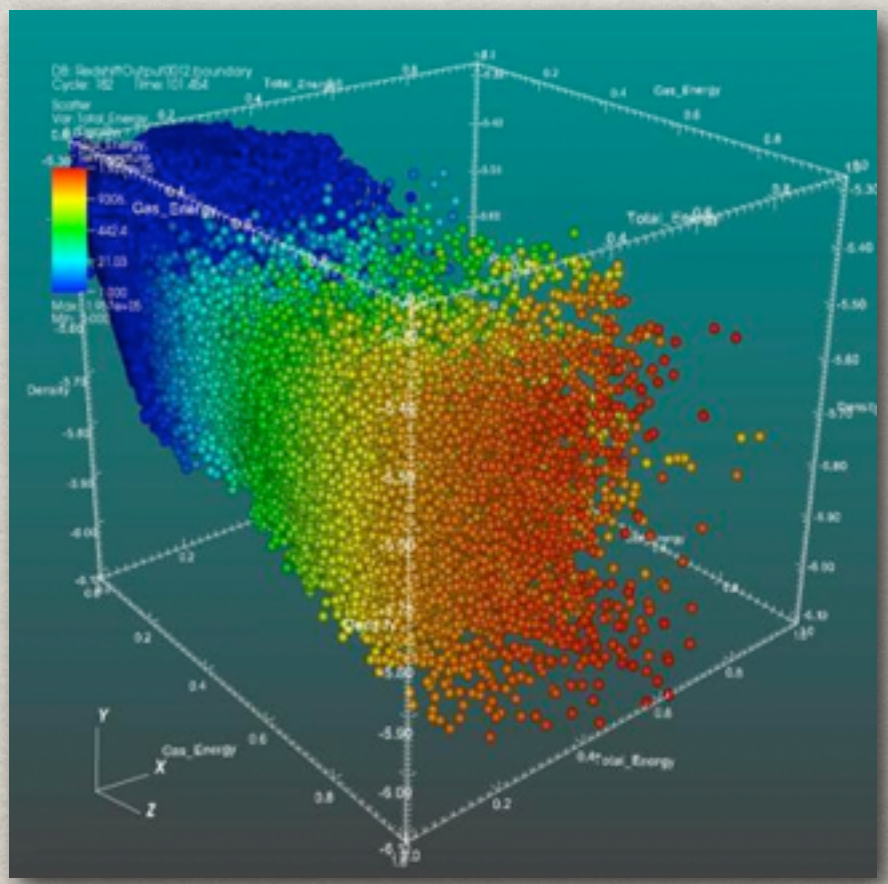
- Explore relationship between two variables



Scatterplot of Yellowstone's Old Faithful wait time versus eruption duration

Scatterplot

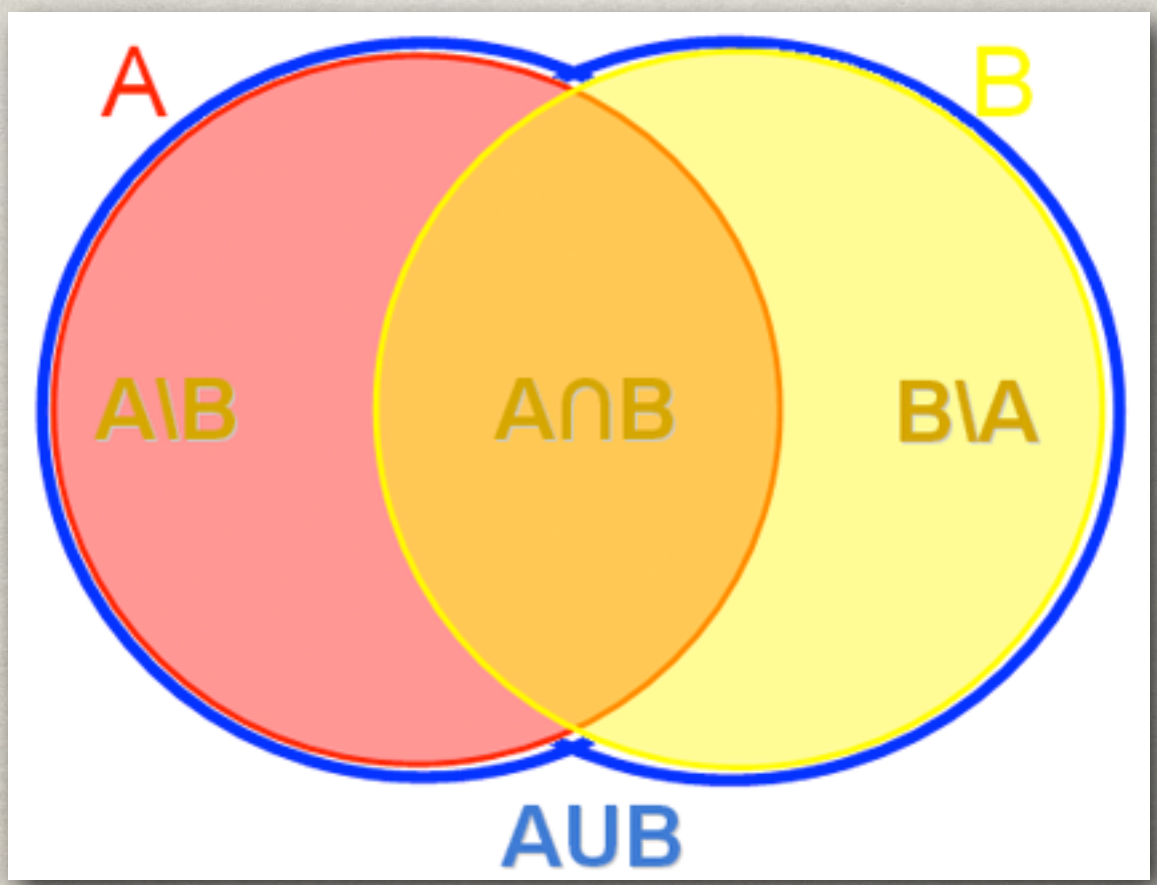
- Explore relationship between two variables



3D scatterplot (3 axes)
with a fourth variable visualized using colour

Venn Diagram

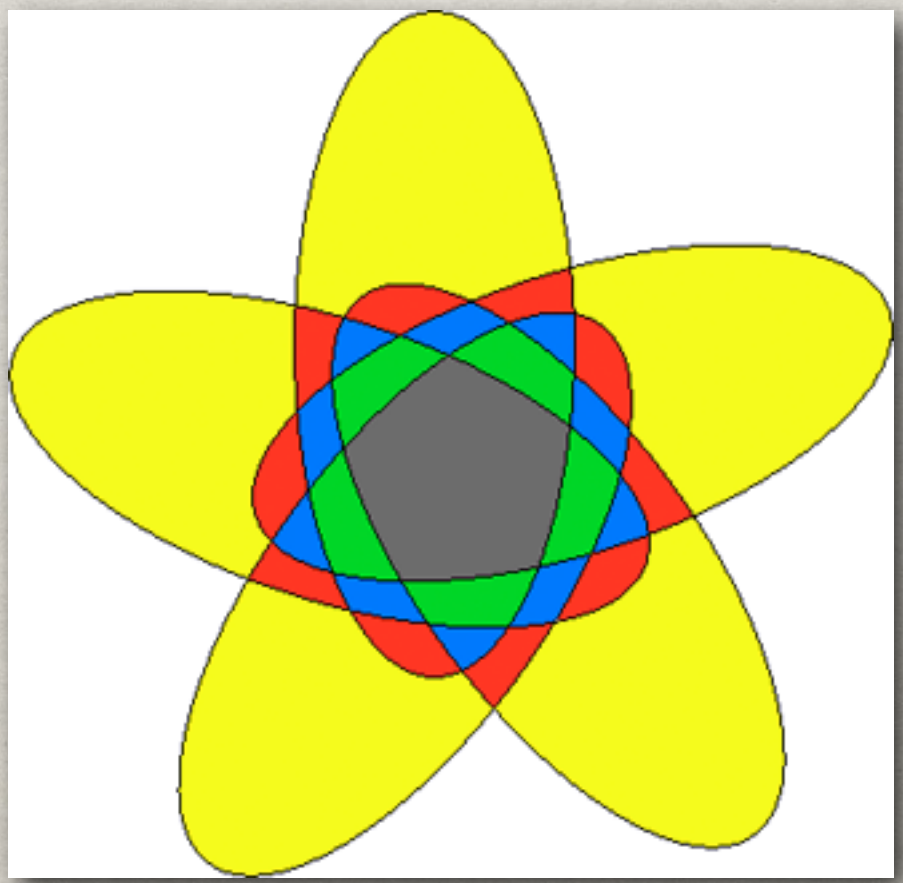
- Show commonality and overlap



Mathematical description of Venn diagram's areas of intersection, union, and single item

Venn Diagram

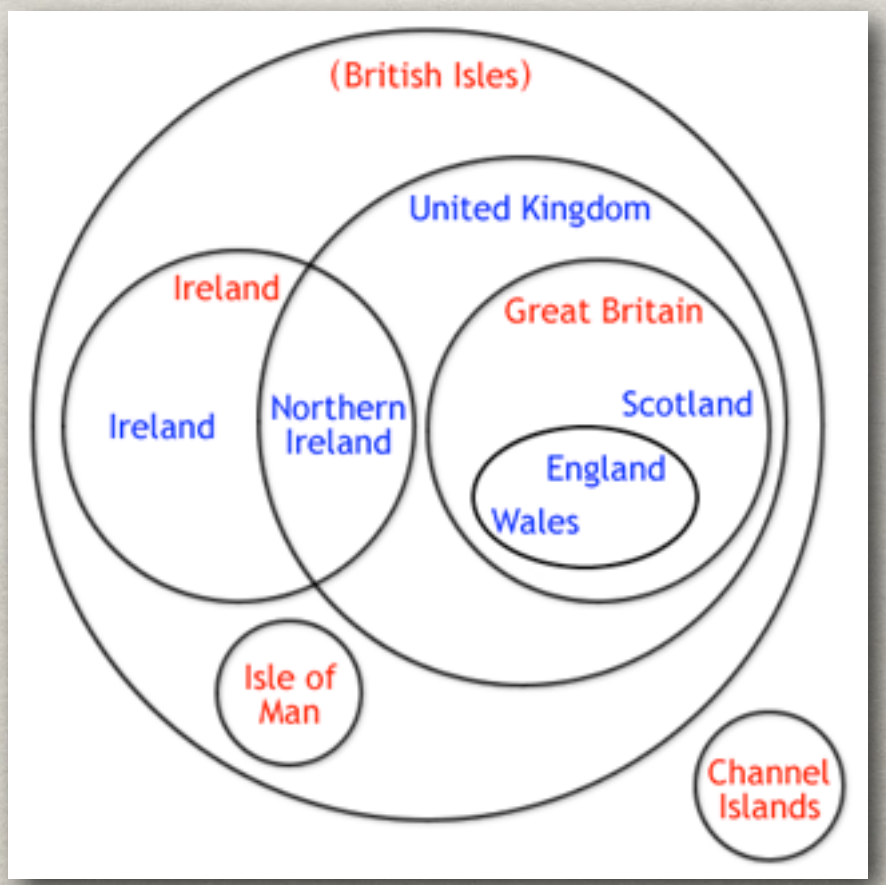
- Show commonality and overlap



Venn diagram for n=5 sets
with five-fold rotational symmetry

Venn Diagram

- Show commonality and overlap



British Isles Venn diagram

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