Data Visualization

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Mentor: Kayla Irish
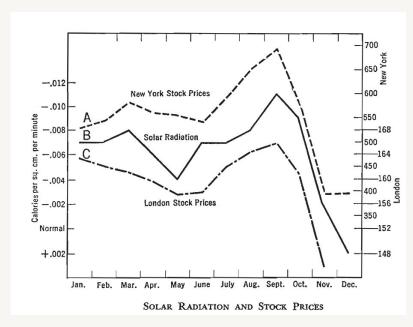
The Visual Display of Quantitative Information
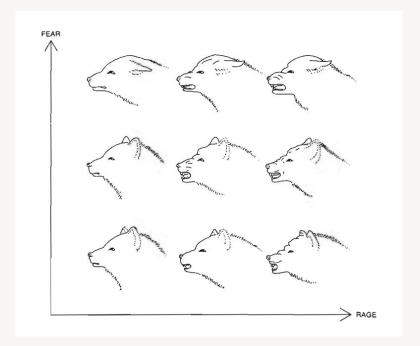
Edward R. Tufte

Tufte's Perspective: Graphical Excellence

- Graphics ought to *reveal* Data, rather than invent data
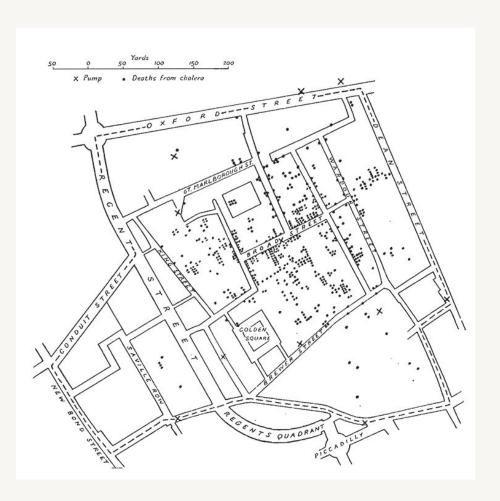- Graphics should present interesting data in a well-designed way
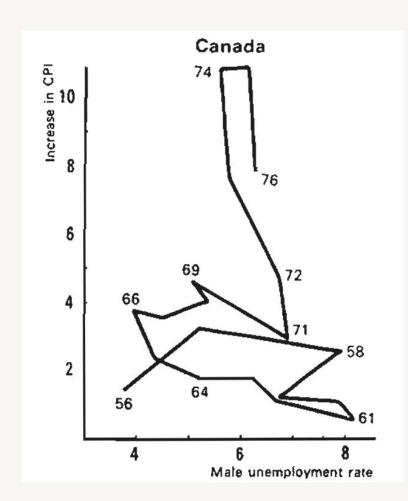- "Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space".
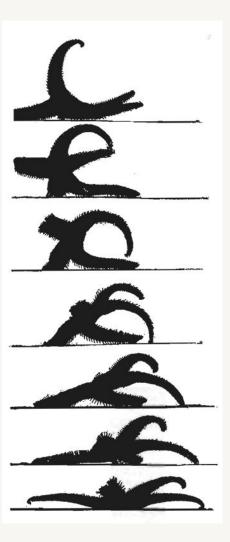
Graphical Excellence: Examples
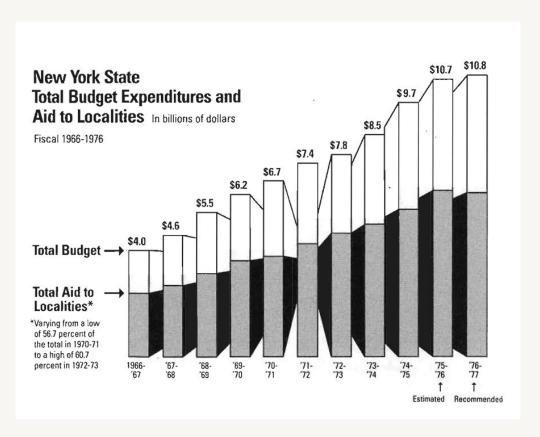
Tufte's Perspective: Graphical Integrity

- The Power Law: Perceived vs. Measured Area

$$\text{Perceived Area} = (\text{Measured Area})^{X}; X = 0.8 \pm 0.3$$

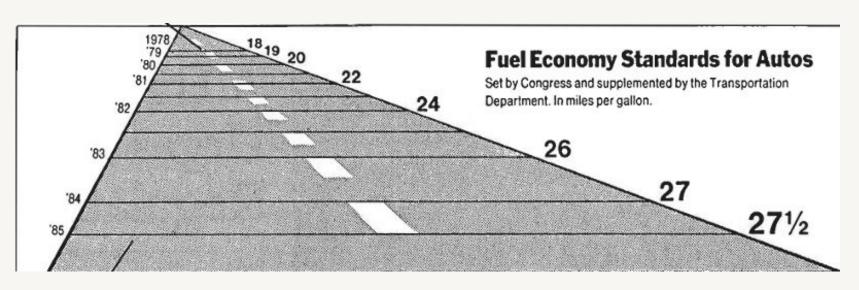- Lie Factor:

$$\text{Lie Factor} = \frac{\text{Size of Effect Shown on Graphic}}{\text{Size of Actual Effect}}$$

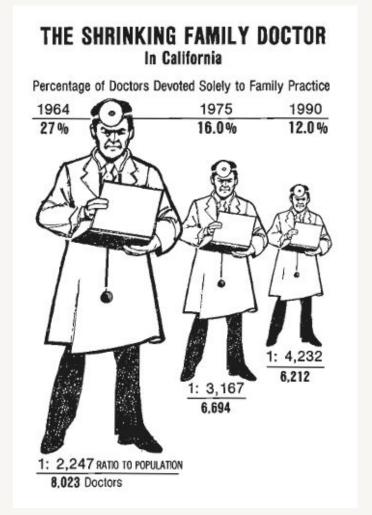- Context is critical. We need to answer the question "Compared to what?

New York State Total Budget Expenditures and Aid to Localities In billions of dollars

Fiscal 1966-1976

*Varying from a low of 56.7 percent of the total in 1970-71 to a high of 60.7 percent in 1972-73

Bad Examples of Graphical Integrity

Fuel Economy Standards for Autos
Set by Congress and supplemented by the Transportation Department. In miles per gallon.

1978 '79 '80 '81 '82 '83 '84 '85
18 19 20 22 24 26 27 27½

$$\text{Measured Effect} = \frac{27.5 - 18}{18} = 53\%$$

$$\text{Depicted Effect} = \frac{5.3\text{in} - 0.6\text{in}}{0.6\text{in}} = 743\%$$

$$\text{Lie Factor} = \frac{743\%}{53\%} = 14.8$$

THE SHRINKING FAMILY DOCTOR
In California

Percentage of Doctors Devoted Solely to Family Practice

1964	1975	1990
27%	16.0%	12.0%

1: 4,232 / 6,212
1: 3,167 / 6,694
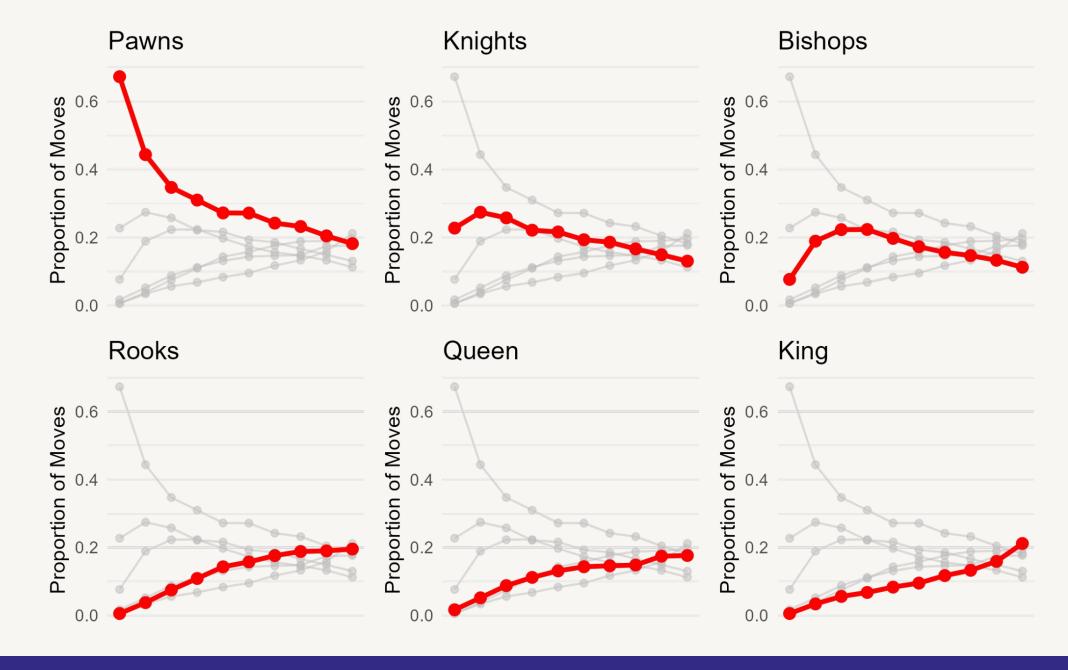1: 2,247 RATIO TO POPULATION / 8,023 Doctors
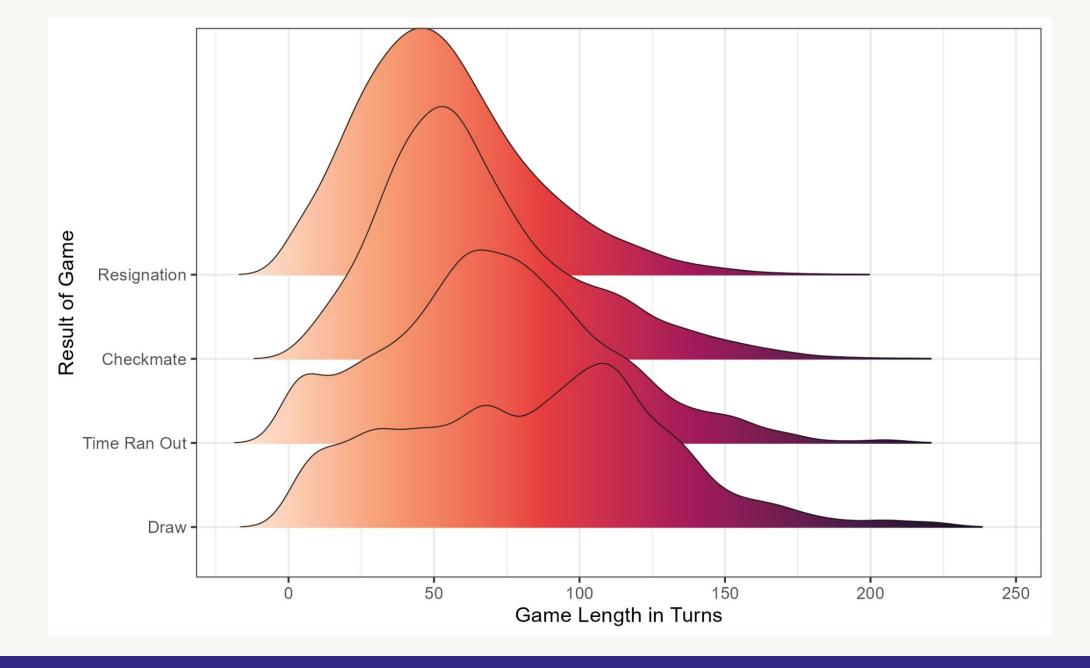
Data Visualization in Practice

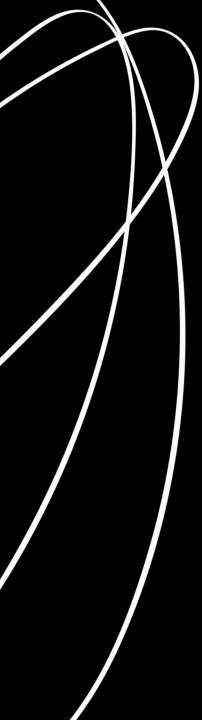Visualizations as Analysis for a Sample Dataset

The Chess Dataset

- Tidy Tuesday 2024 Week 40 (October 1st, 2024)

- Contains records of over 20,000 chess games played on Lichess.com

- Includes all the information you would want to know about a chess game:

  - Starting and Ending Time

  - The ratings of the White and Black Players

  - The openings of the White and Black Players

  - The complete list of moves

  - The winner of the game, either White or Black (NA if draw)

  - The result of the game (Draw, Checkmate, Resignation, Time Runs Out)

	♟	♞	♝	♜	♛	♚
Beginner	0.357	0.198	0.146	0.098	0.128	0.09
Intermediate	0.306	0.198	0.163	0.124	0.133	0.099
Advanced	0.304	0.192	0.164	0.142	0.122	0.103
Master	0.307	0.197	0.164	0.146	0.118	0.097
National Master	0.297	0.185	0.161	0.16	0.112	0.111
International Master	0.263	0.15	0.152	0.2	0.136	0.121

Thank You!

Any Questions?