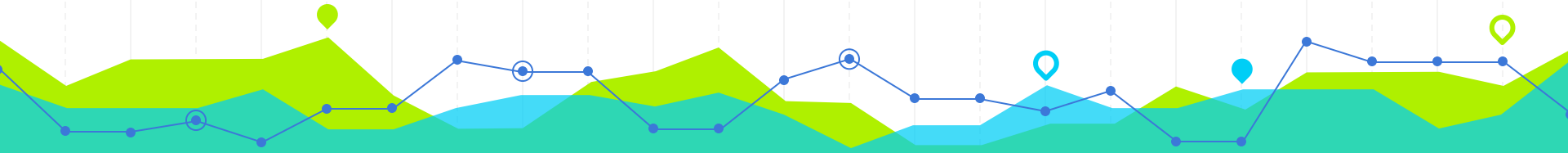


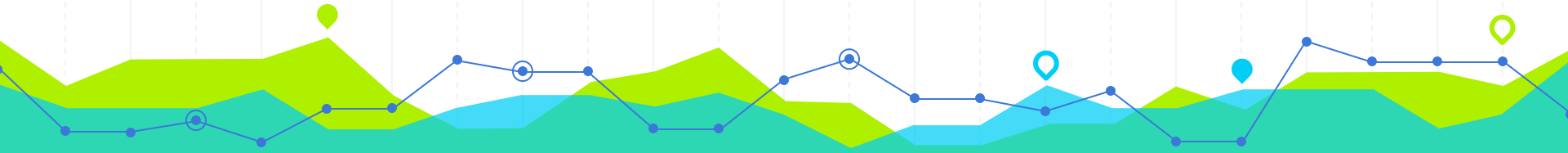
# DATA VISUALIZATION

Enrique Viña Alonso - alu0101337760

Aram Pérez Dios - alu0101244488

# INDEX

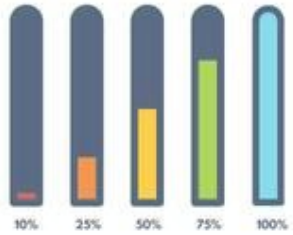




# 1 INTRODUCTION

And a bit of history

# WHAT IS DATA VISUALIZATION



Sample Text

Sample Text

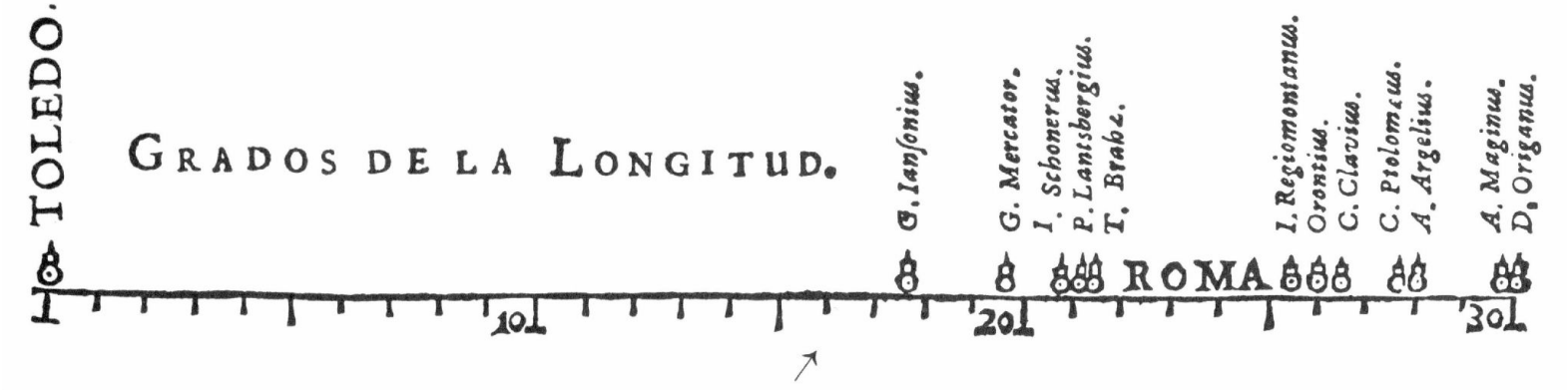
Sample Text

# WHY IS DATA VISUALIZATION IMPORTANT

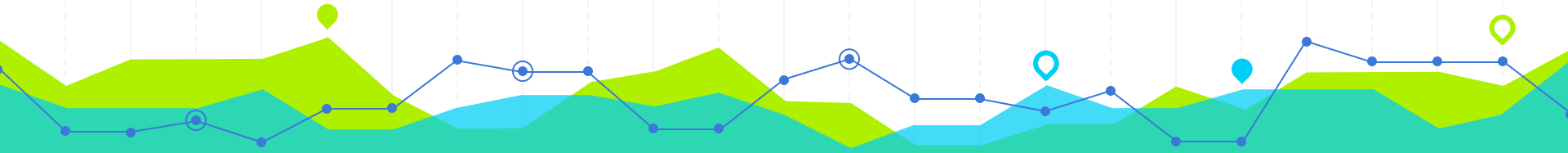
## BETTER DECISION MAKING

## MEANINGFUL NARRATIVE

# DATA VISUALIZATION HISTORY




**Michael Florent Van Langren, 1644**



# GOOD PRACTICES

2

What to do and not to

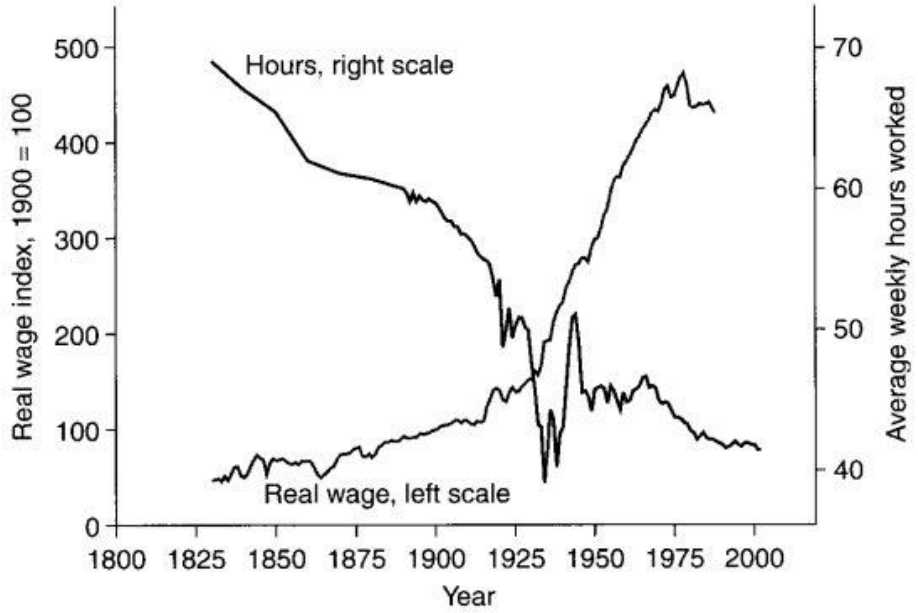
# GOOD PRACTICES

a. **Accurate:** The visualization should accurately represent the data and its trends

b. **Clear:** Your visualization should be easy to understand

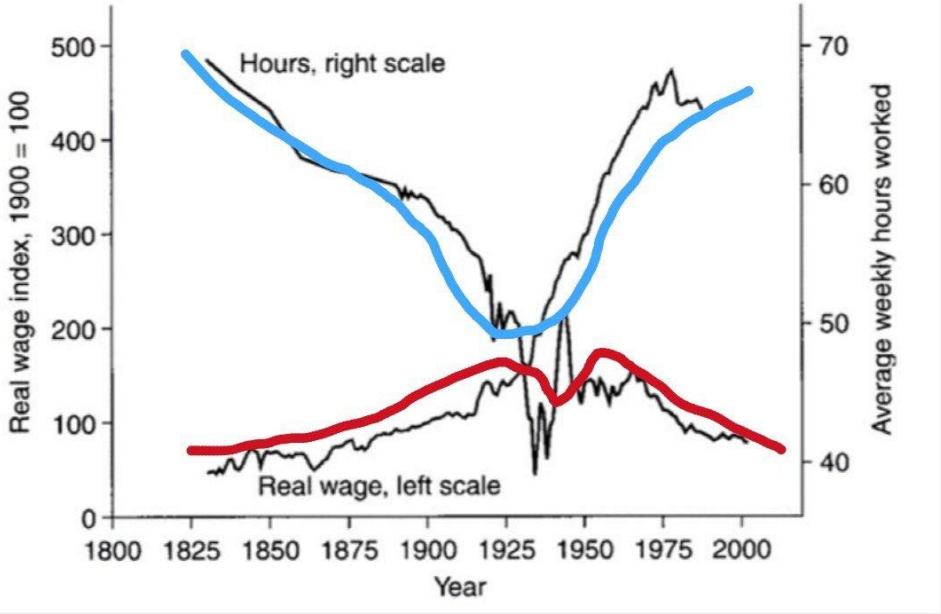
# GOOD PRACTICES

**Having a clear representation:**



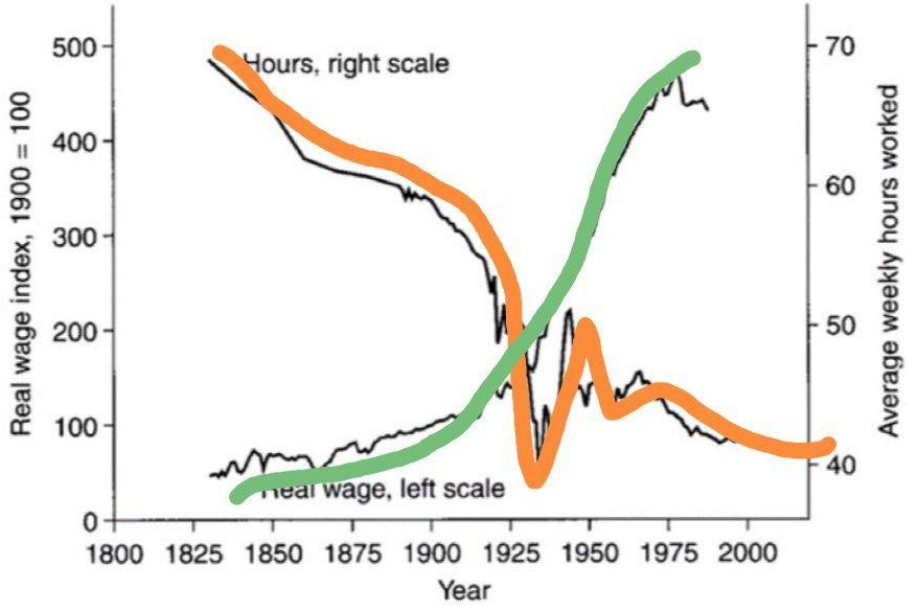
# GOOD PRACTICES

**Having a clear representation:**



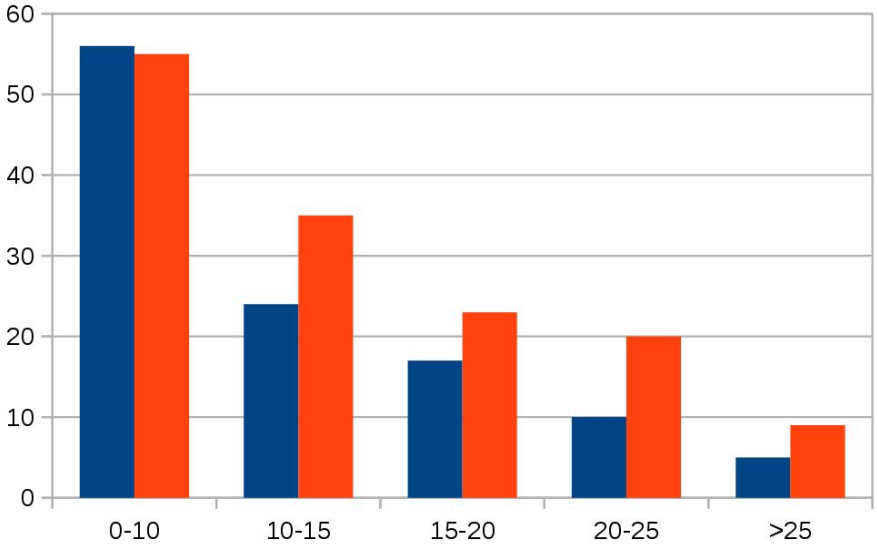
# GOOD PRACTICES

**Having a clear representation:**



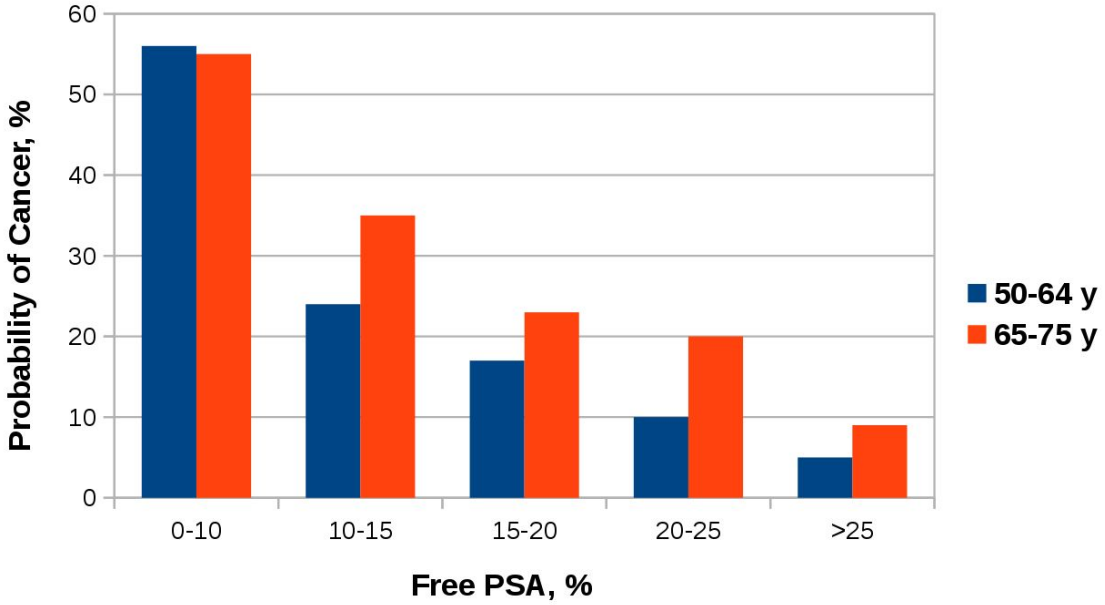
# GOOD PRACTICES

**Axis labels and graph legend:**

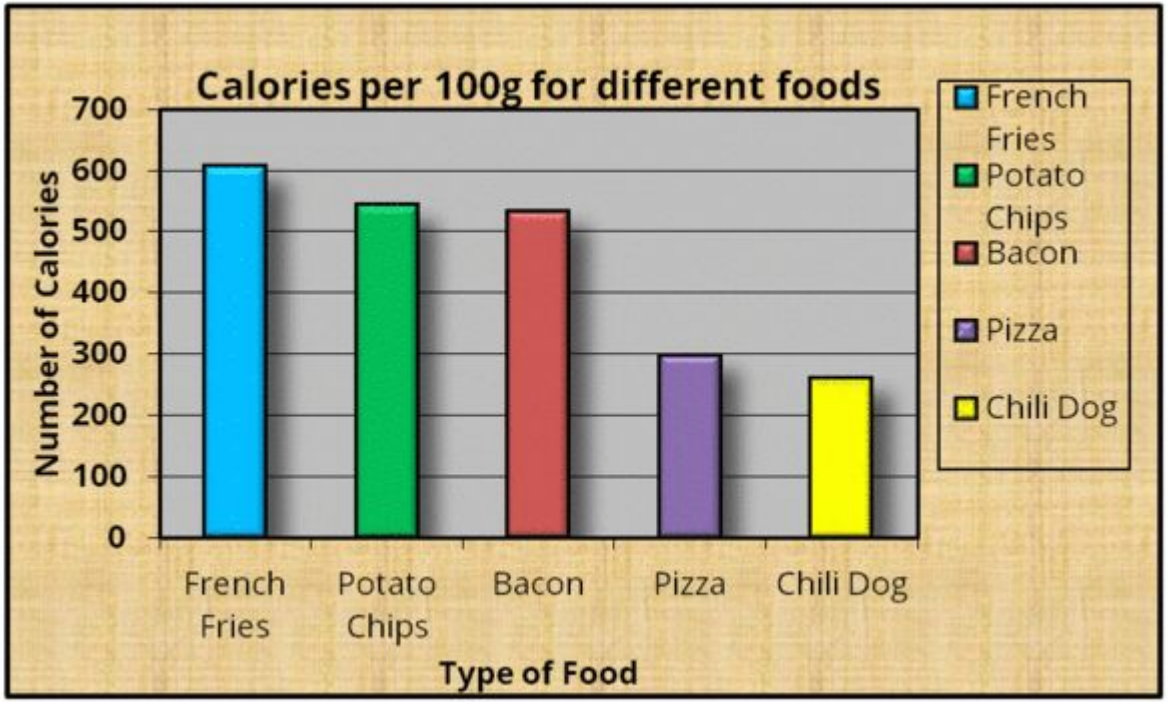


# GOOD PRACTICES

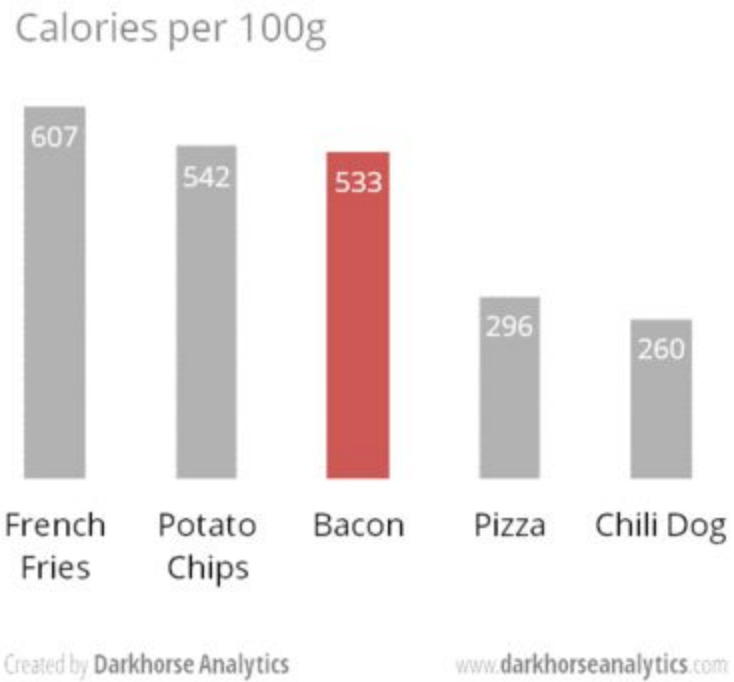
**Axis labels and graph legend:**



# GOOD PRACTICES



# GOOD PRACTICES



# GOOD PRACTICES

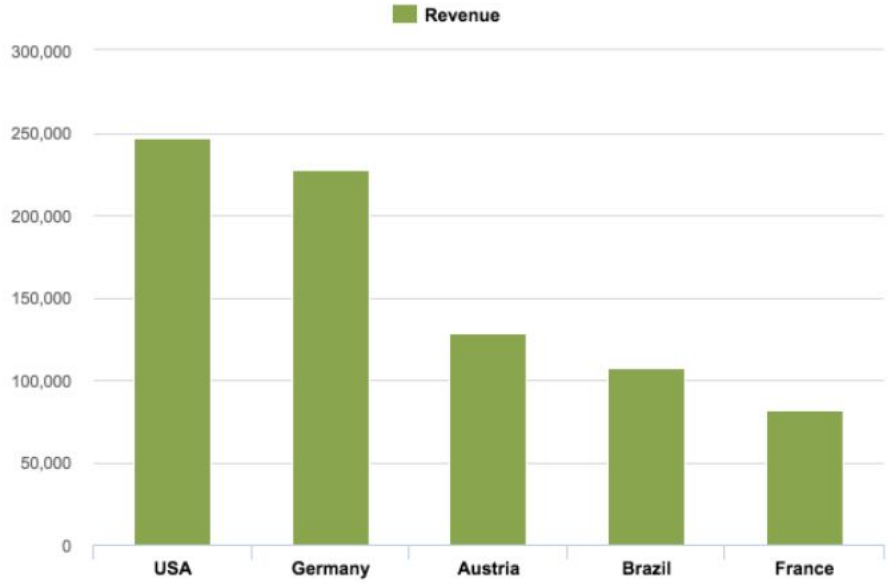
**Select the right chart**

- Line chart
- Bar Chart
- Pie Chart
- Histogram
- Scatter Plot
- BoxPlot
- Bubble Chart
- Treemap
- radar graph
- Heatmap
- Density Maps
- ...

# GOOD PRACTICES

**Select the right chart: Column chart**

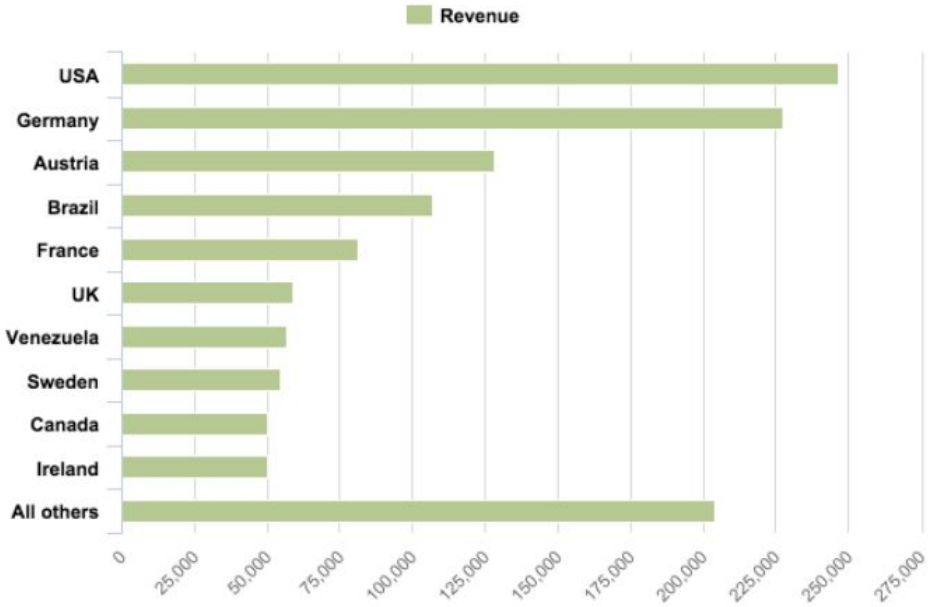
- **For comparisons**
- **Small number of categories**
- **Axis must start at 0**



# GOOD PRACTICES

**Select the right chart: Bar chart**

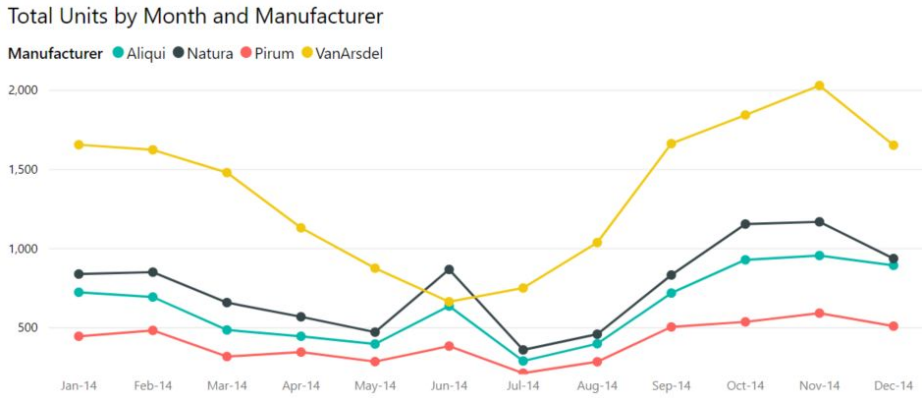
- **Bigger category names**
- **More Categories**



# GOOD PRACTICES

**Select the right chart: Line chart**

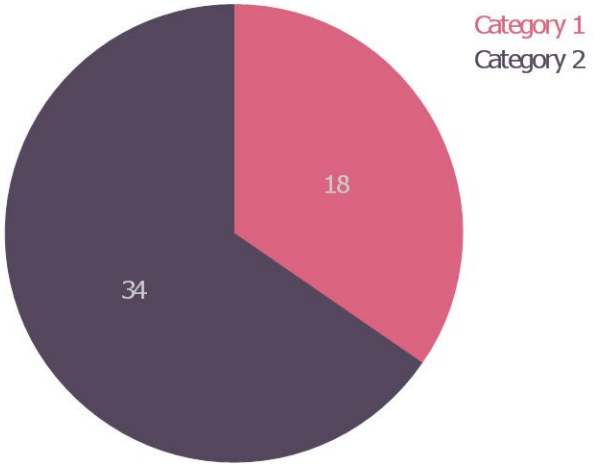
- **When the dataset is continuous**
- **The axis can start as non zero, but not ideal**
- **Careful with the aspect ratio**



# GOOD PRACTICES

**Select the right chart: Pie chart**

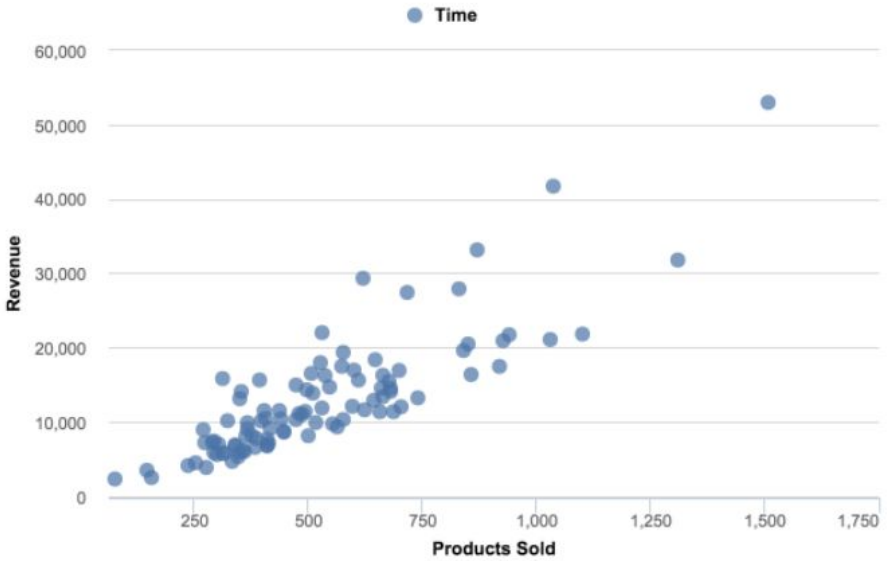
- **Less than 6 categories**
- **Unless there's a dominant class**
- **Ideally, only 2 categories**
- **NO 3D EFFECTS**



# GOOD PRACTICES

**Select the right chart: Scatter plots**

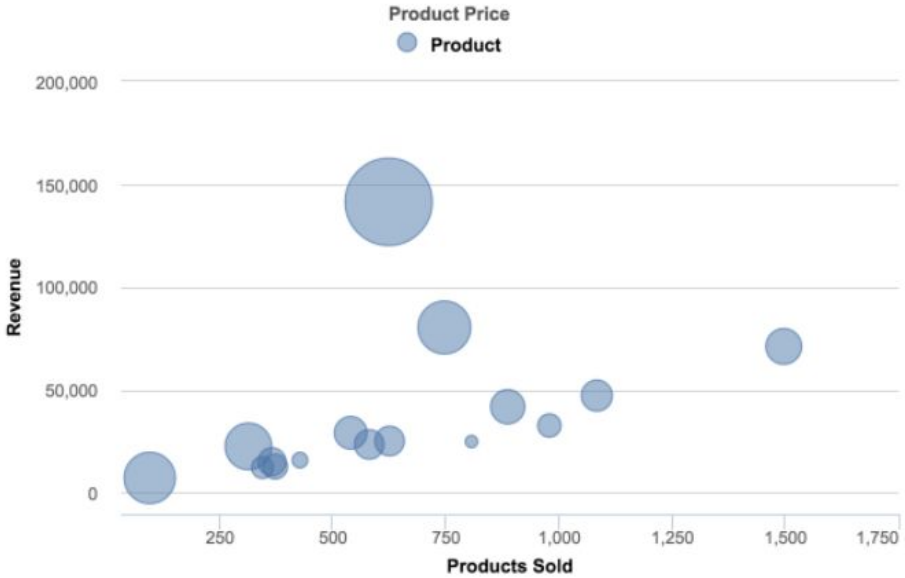
- **Used for dispersion and correlation analysis**
- **Used to represent clusters too**



# GOOD PRACTICES

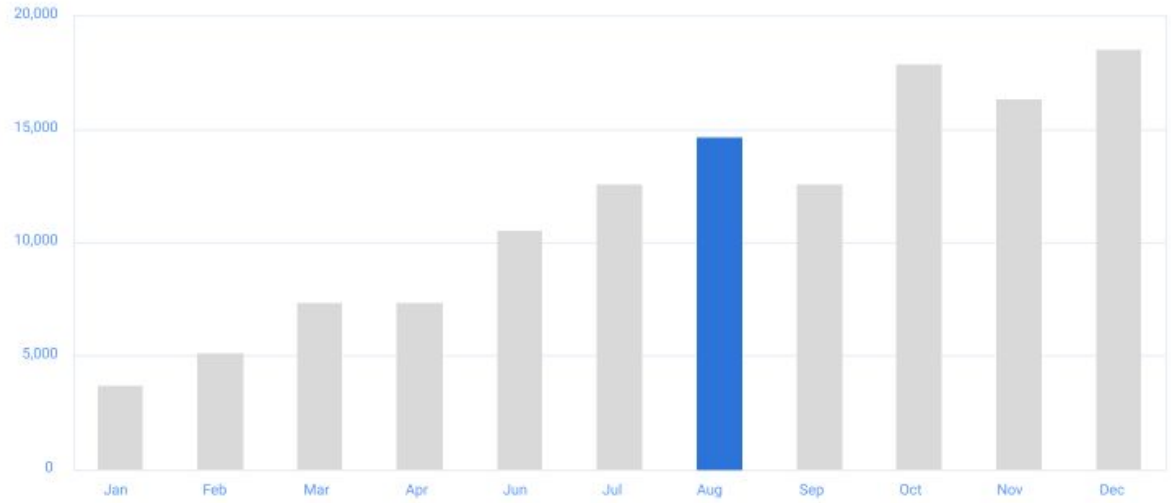
**Select the right chart: Bubble plots**

- **Used to add a dimension to scatter plots**
- **Used to represent relationships**



# GOOD PRACTICES

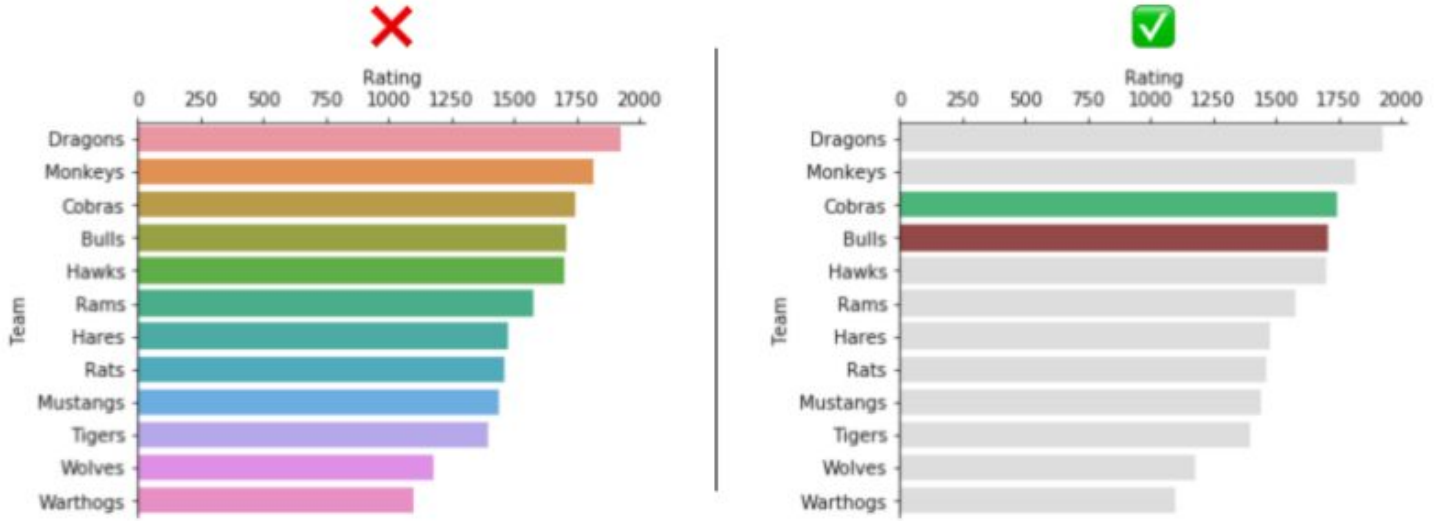
**Good use of color:**




The blue bar among grey bars clearly communicates the focus point to the audience.

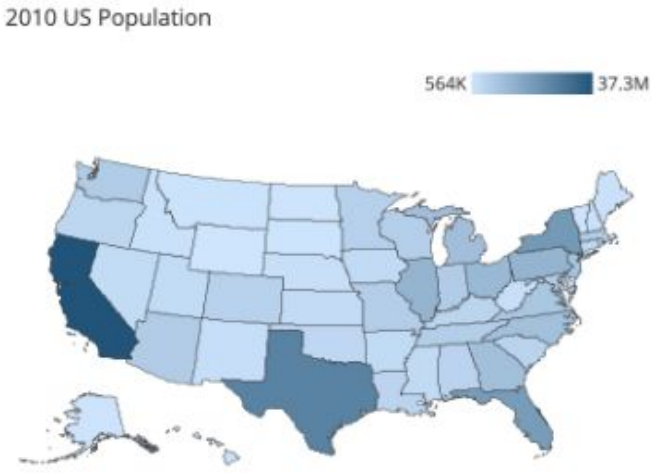
# GOOD PRACTICES

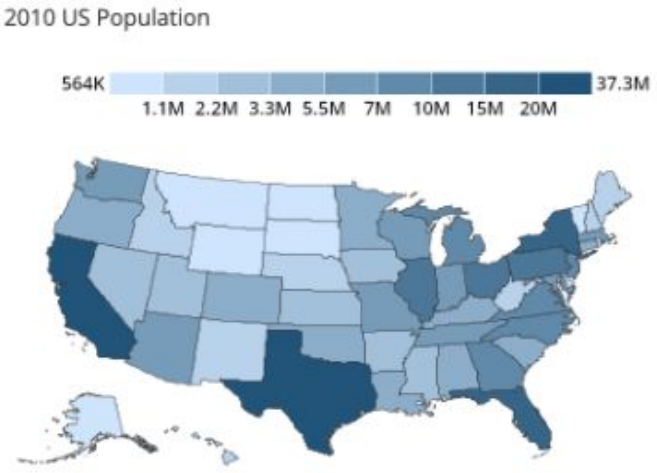
**Good use of color:**



# GOOD PRACTICES

**Good use of color:**

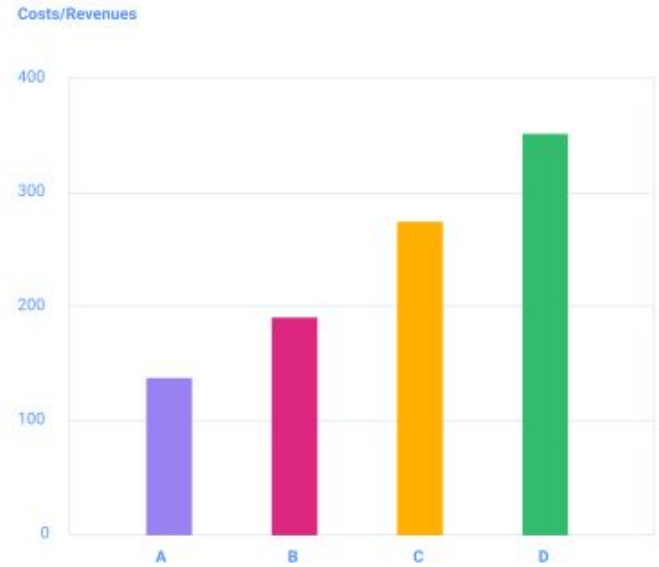


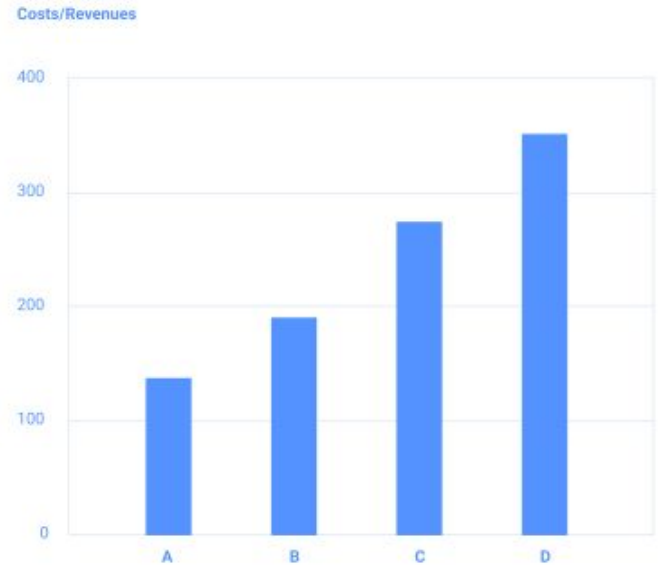



# GOOD PRACTICES

**Applying the Gestalt principles:**

- **Similarity**

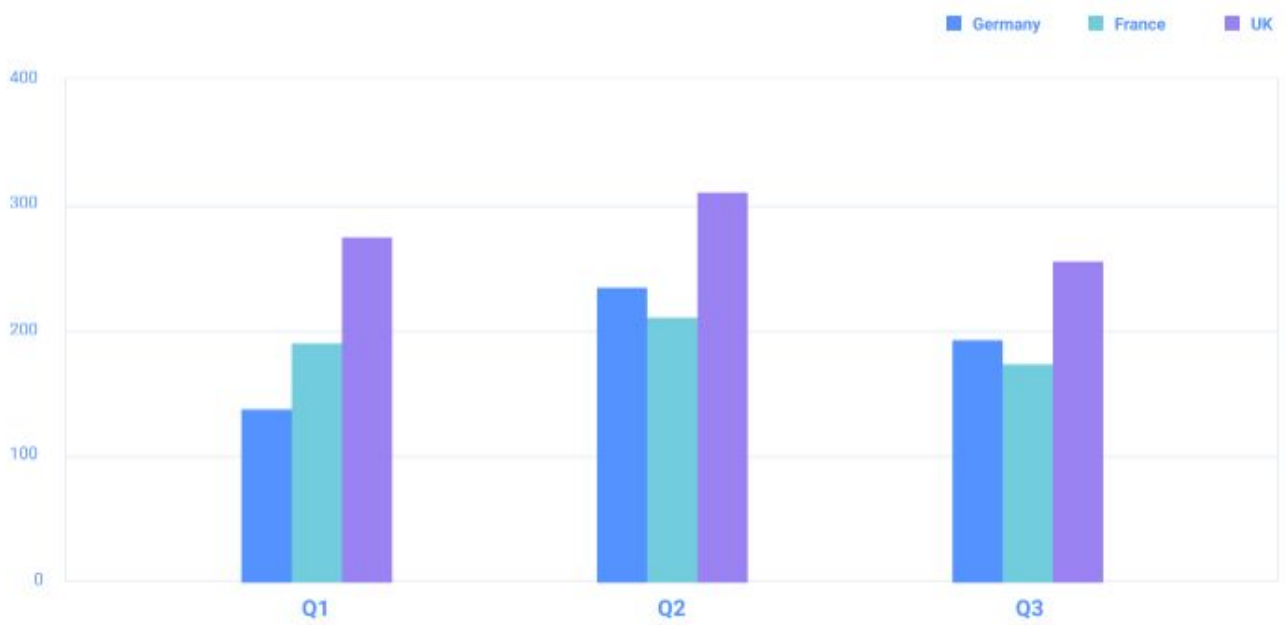


# GOOD PRACTICES

**Applying the Gestalt principles:**

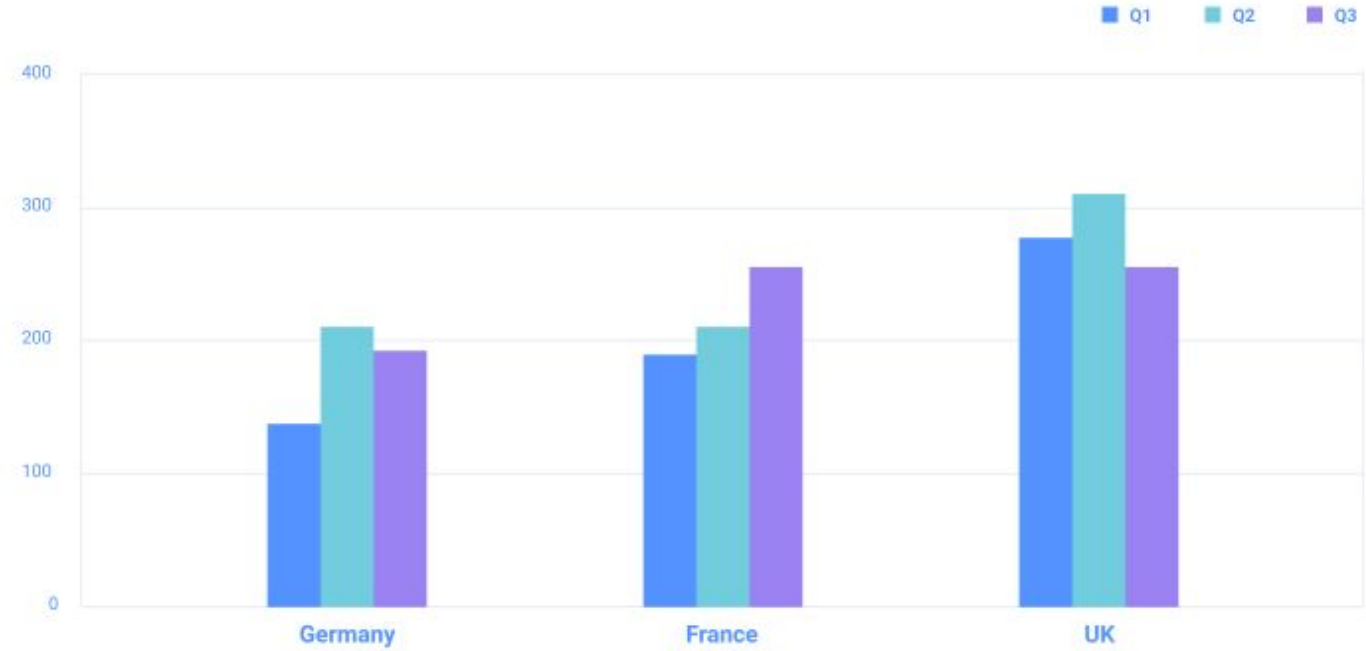
- **Proximity**



# GOOD PRACTICES

**Applying the Gestalt principles:**

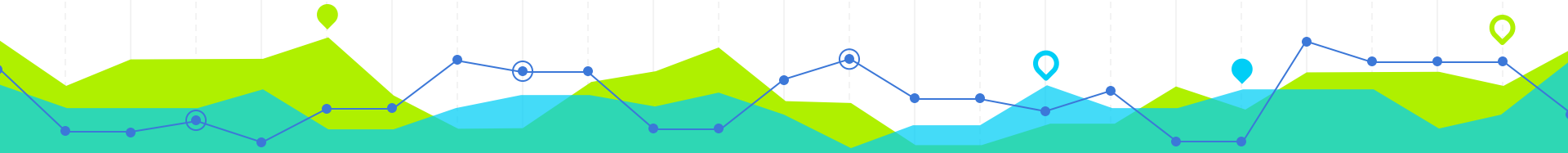
- **Proximity**



# GOOD PRACTICES

**Applying the Gestalt principles:**

- **Enclosure**



# PROS AND CONS OF DATA VISUALIZATION

# 3

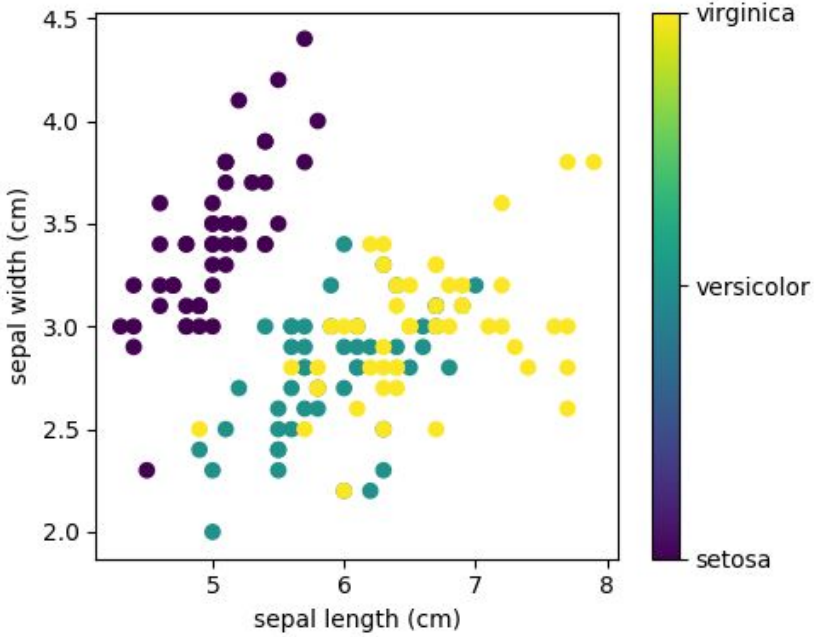
# PROS OF DATA VISUALIZATION

## Information sharing:

Table I

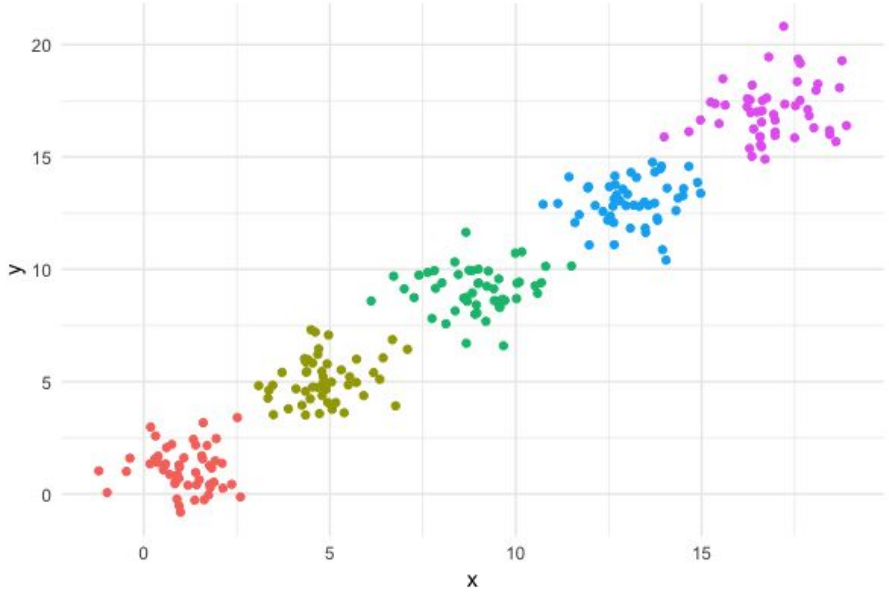
| *Iris setosa* | | | | *Iris versicolor* | | | | *Iris virginica* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sepal length | Sepal width | Petal length | Petal width | Sepal length | Sepal width | Petal length | Petal width | Sepal length | Sepal width | Petal length | Petal width |
| 5·1 | 3·5 | 1·4 | 0·2 | 7·0 | 3·2 | 4·7 | 1·4 | 6·3 | 3·3 | 6·0 | 2·5 |
| 4·9 | 3·0 | 1·4 | 0·2 | 6·4 | 3·2 | 4·5 | 1·5 | 5·8 | 2·7 | 5·1 | 1·9 |
| 4·7 | 3·2 | 1·3 | 0·2 | 6·9 | 3·1 | 4·9 | 1·5 | 7·1 | 3·0 | 5·9 | 2·1 |
| 4·6 | 3·1 | 1·5 | 0·2 | 5·5 | 2·3 | 4·0 | 1·3 | 6·3 | 2·9 | 5·6 | 1·8 |
| 5·0 | 3·6 | 1·4 | 0·2 | 6·5 | 2·8 | 4·6 | 1·5 | 6·5 | 3·0 | 5·8 | 2·2 |
| 5·4 | 3·9 | 1·7 | 0·4 | 5·7 | 2·8 | 4·5 | 1·3 | 7·6 | 3·0 | 6·6 | 2·1 |
| 4·6 | 3·4 | 1·4 | 0·3 | 6·3 | 3·3 | 4·7 | 1·6 | 4·9 | 2·5 | 4·5 | 1·7 |
| 5·0 | 3·4 | 1·5 | 0·2 | 4·9 | 2·4 | 3·3 | 1·0 | 7·3 | 2·9 | 6·3 | 1·8 |
| 4·4 | 2·9 | 1·4 | 0·2 | 6·6 | 2·9 | 4·6 | 1·3 | 6·7 | 2·5 | 5·8 | 1·8 |
| 4·9 | 3·1 | 1·5 | 0·1 | 5·2 | 2·7 | 3·9 | 1·4 | 7·2 | 3·6 | 6·1 | 2·5 |
| 5·4 | 3·7 | 1·5 | 0·2 | 5·0 | 2·0 | 3·5 | 1·0 | 6·5 | 3·2 | 5·1 | 2·0 |
| 4·8 | 3·4 | 1·6 | 0·2 | 5·9 | 3·0 | 4·2 | 1·5 | 6·4 | 2·7 | 5·3 | 1·9 |
| 4·8 | 3·0 | 1·4 | 0·1 | 6·0 | 2·2 | 4·0 | 1·0 | 6·8 | 3·0 | 5·5 | 2·1 |
| 4·3 | 3·0 | 1·1 | 0·1 | 6·1 | 2·9 | 4·7 | 1·4 | 5·7 | 2·5 | 5·0 | 2·0 |
| 5·8 | 4·0 | 1·2 | 0·2 | 5·6 | 2·9 | 3·6 | 1·3 | 5·8 | 2·8 | 5·1 | 2·4 |
| 5·7 | 4·4 | 1·5 | 0·4 | 6·7 | 3·1 | 4·4 | 1·4 | 6·4 | 3·2 | 5·3 | 2·3 |
| 5·4 | 3·9 | 1·3 | 0·4 | 5·6 | 3·0 | 4·5 | 1·5 | 6·5 | 3·0 | 5·5 | 1·8 |
| 5·1 | 3·5 | 1·4 | 0·3 | 5·8 | 2·7 | 4·1 | 1·0 | 7·7 | 3·8 | 6·7 | 2·2 |
| 5·7 | 3·8 | 1·7 | 0·3 | 6·2 | 2·2 | 4·5 | 1·5 | 7·7 | 2·6 | 6·9 | 2·3 |
| 5·1 | 3·8 | 1·5 | 0·3 | 5·6 | 2·5 | 3·9 | 1·1 | 6·0 | 2·2 | 5·0 | 1·5 |
| 5·4 | 3·4 | 1·7 | 0·2 | 5·9 | 3·2 | 4·8 | 1·8 | 6·9 | 3·2 | 5·7 | 2·3 |
| 5·1 | 3·7 | 1·5 | 0·4 | 6·1 | 2·8 | 4·0 | 1·3 | 5·6 | 2·8 | 4·9 | 2·0 |
| 4·6 | 3·6 | 1·0 | 0·2 | 6·3 | 2·5 | 4·9 | 1·5 | 7·7 | 2·8 | 6·7 | 2·0 |
| 5·1 | 3·3 | 1·7 | 0·5 | 6·1 | 2·8 | 4·7 | 1·2 | 6·3 | 2·7 | 4·9 | 1·8 |
| 4·8 | 3·4 | 1·9 | 0·2 | 6·4 | 2·9 | 4·3 | 1·3 | 6·7 | 3·3 | 5·7 | 2·1 |
| 5·0 | 3·0 | 1·6 | 0·2 | 6·6 | 3·0 | 4·4 | 1·4 | 7·2 | 3·2 | 6·0 | 1·8 |
| 5·0 | 3·4 | 1·6 | 0·4 | 6·8 | 2·8 | 4·8 | 1·4 | 6·2 | 2·8 | 4·8 | 1·8 |
| 5·2 | 3·5 | 1·5 | 0·2 | 6·7 | 3·0 | 5·0 | 1·7 | 6·1 | 3·0 | 4·9 | 1·8 |
| 5·2 | 3·4 | 1·4 | 0·2 | 6·0 | 2·9 | 4·5 | 1·5 | 6·4 | 2·8 | 5·6 | 2·1 |
| 4·7 | 3·2 | 1·6 | 0·2 | 5·7 | 2·6 | 3·5 | 1·0 | 7·2 | 3·0 | 5·8 | 1·6 |
| 4·8 | 3·1 | 1·6 | 0·2 | 5·5 | 2·4 | 3·8 | 1·1 | 7·4 | 2·8 | 6·1 | 1·9 |
| 5·4 | 3·4 | 1·5 | 0·4 | 5·5 | 2·4 | 3·7 | 1·0 | 7·9 | 3·8 | 6·4 | 2·0 |
| 5·2 | 4·1 | 1·5 | 0·1 | 5·8 | 2·7 | 3·9 | 1·2 | 6·4 | 2·8 | 5·6 | 2·2 |
| 5·5 | 4·2 | 1·4 | 0·2 | 6·0 | 2·7 | 5·1 | 1·6 | 6·3 | 2·8 | 5·1 | 1·5 |
| 4·9 | 3·1 | 1·5 | 0·2 | 5·4 | 3·0 | 4·5 | 1·5 | 6·1 | 2·6 | 5·6 | 1·4 |
| 5·0 | 3·2 | 1·2 | 0·2 | 6·0 | 3·4 | 4·5 | 1·6 | 7·7 | 3·0 | 6·1 | 2·3 |
| 5·5 | 3·5 | 1·3 | 0·2 | 6·7 | 3·1 | 4·7 | 1·5 | 6·3 | 3·4 | 5·6 | 2·4 |
| 4·9 | 3·6 | 1·4 | 0·1 | 6·3 | 2·3 | 4·4 | 1·3 | 6·4 | 3·1 | 5·5 | 1·8 |
| 4·4 | 3·0 | 1·3 | 0·2 | 5·6 | 3·0 | 4·1 | 1·3 | 6·0 | 3·0 | 4·8 | 1·8 |
| 5·1 | 3·4 | 1·5 | 0·2 | 5·5 | 2·5 | 4·0 | 1·3 | 6·9 | 3·1 | 5·4 | 2·1 |
| 5·0 | 3·5 | 1·3 | 0·3 | 5·5 | 2·6 | 4·4 | 1·2 | 6·7 | 3·1 | 5·6 | 2·4 |
| 4·5 | 2·3 | 1·3 | 0·3 | 6·1 | 3·0 | 4·6 | 1·4 | 6·9 | 3·1 | 5·1 | 2·3 |
| 4·4 | 3·2 | 1·3 | 0·2 | 5·8 | 2·6 | 4·0 | 1·2 | 5·8 | 2·7 | 5·1 | 1·9 |
| 5·0 | 3·5 | 1·6 | 0·6 | 5·0 | 2·3 | 3·3 | 1·0 | 6·8 | 3·2 | 5·9 | 2·3 |
| 5·1 | 3·8 | 1·9 | 0·4 | 5·6 | 2·7 | 4·2 | 1·3 | 6·7 | 3·3 | 5·7 | 2·5 |
| 4·8 | 3·0 | 1·4 | 0·3 | 5·7 | 3·0 | 4·2 | 1·2 | 6·7 | 3·0 | 5·2 | 2·3 |
| 5·1 | 3·8 | 1·6 | 0·2 | 5·7 | 2·9 | 4·2 | 1·3 | 6·3 | 2·5 | 5·0 | 1·9 |
| 4·6 | 3·2 | 1·4 | 0·2 | 6·2 | 2·9 | 4·3 | 1·3 | 6·5 | 3·0 | 5·2 | 2·0 |
| 5·3 | 3·7 | 1·5 | 0·2 | 5·1 | 2·5 | 3·0 | 1·1 | 6·2 | 3·4 | 5·4 | 2·3 |
| 5·0 | 3·3 | 1·4 | 0·2 | 5·7 | 2·8 | 4·1 | 1·3 | 5·9 | 3·0 | 5·1 | 1·8 |

vs



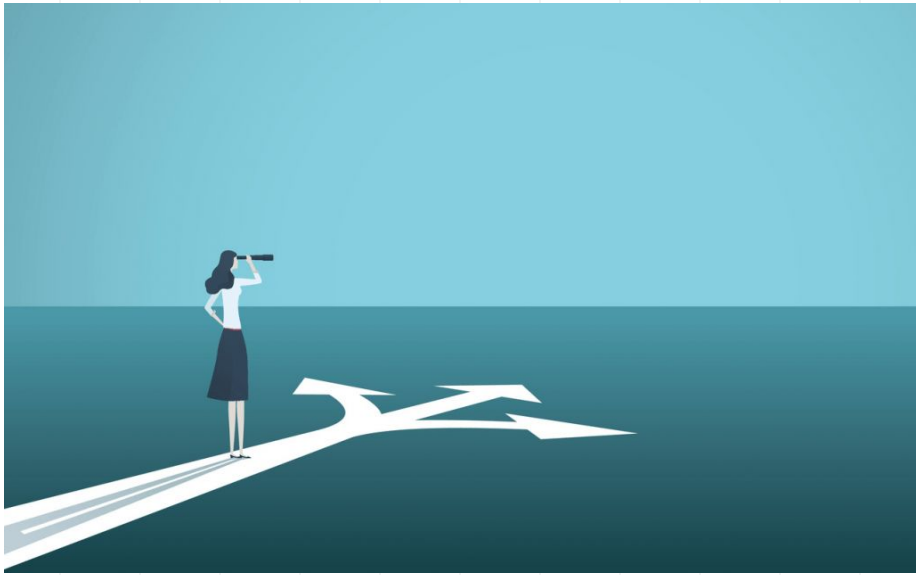
# PROS OF DATA VISUALIZATION

**Easier pattern recognition:**



# PROS OF DATA VISUALIZATION

**Faster decision making:**



# CONS OF DATA VISUALIZATION

- COMPLEX DATA VISUALIZATION IS HARD
- VISUALIZED DATA IS PRONE TO MISINTERPRETATION
- WRONG-MINDED INDIVIDUALS CAN EXPLOIT IT

# EXAMPLES OF MALICIOUS DATA VISUALIZATION

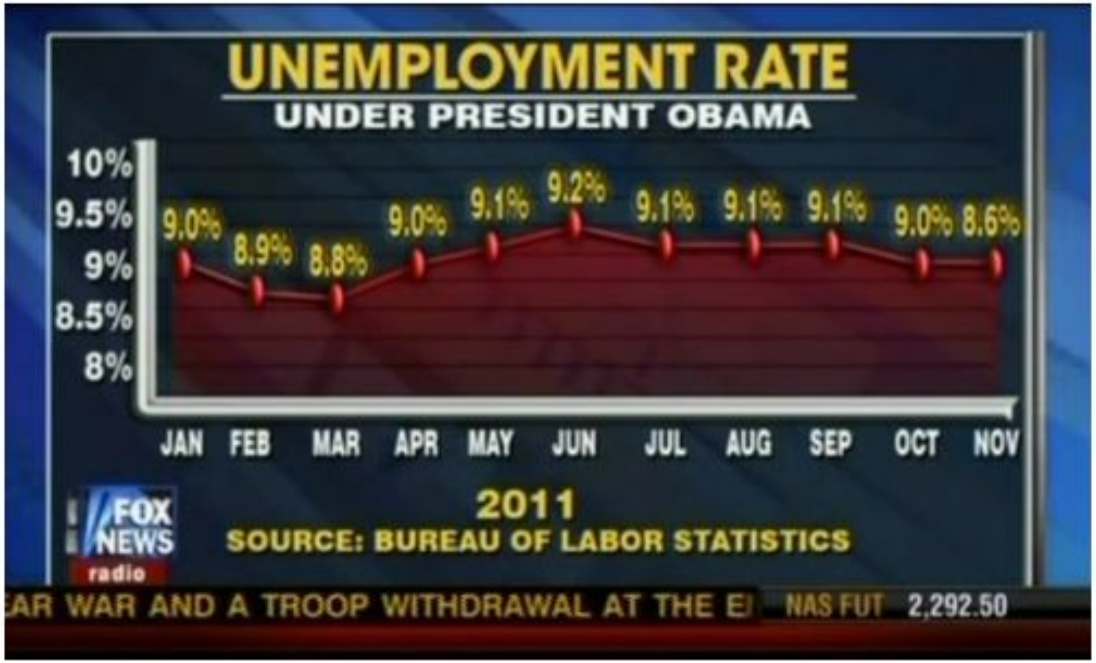
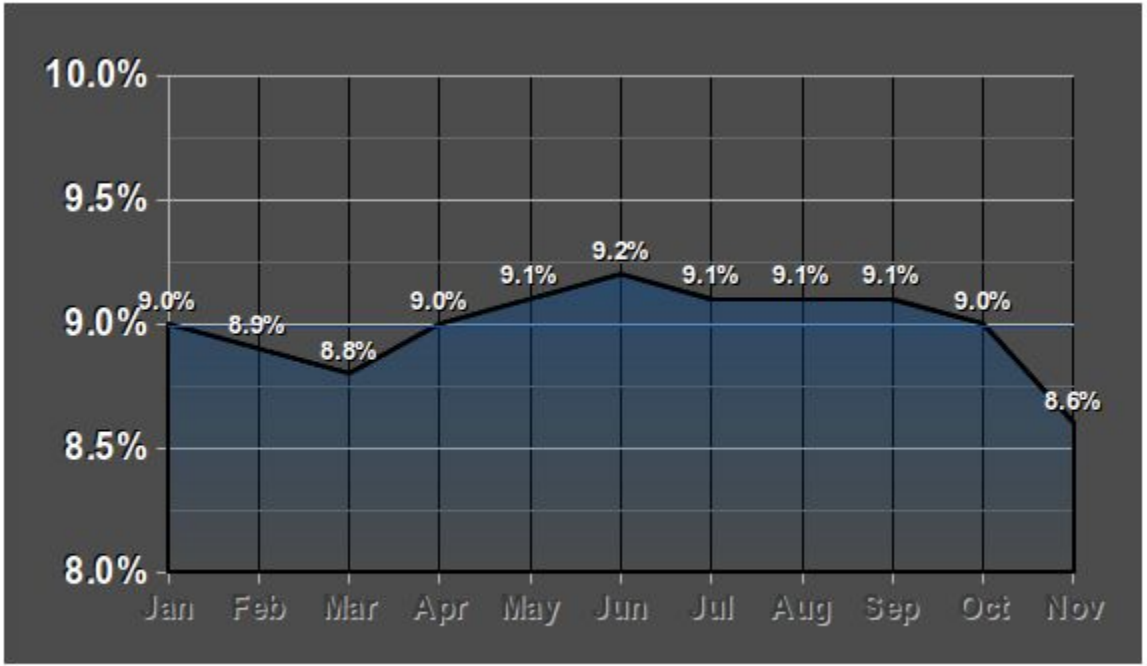



*Image Source: http://cloudfront.mediamatters.org*

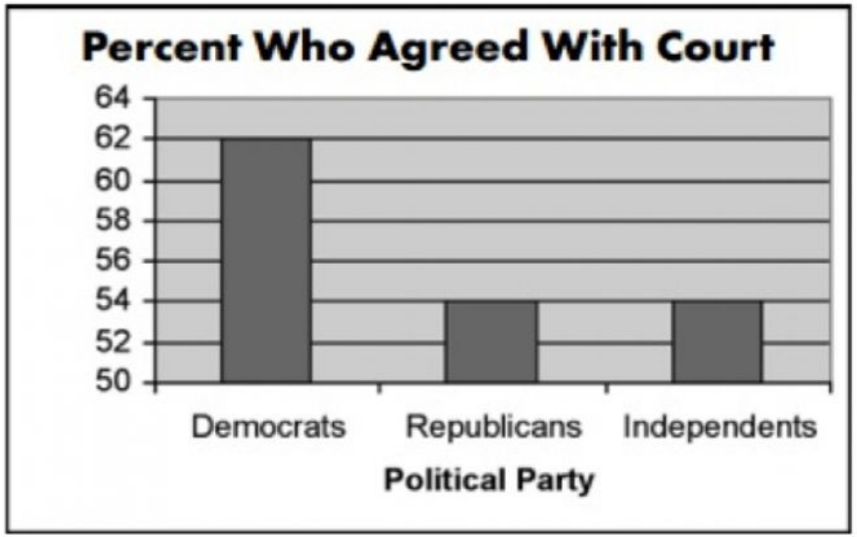
# EXAMPLES OF MALICIOUS DATA VISUALIZATION

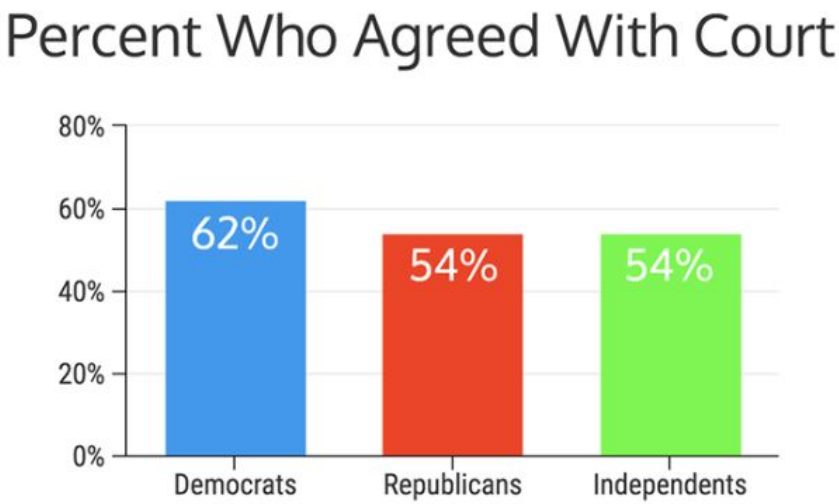



Source: http://freethoughtblogs.com/lousycanuck/2011/12/14/im-better-at-graphs-than-fox-news/

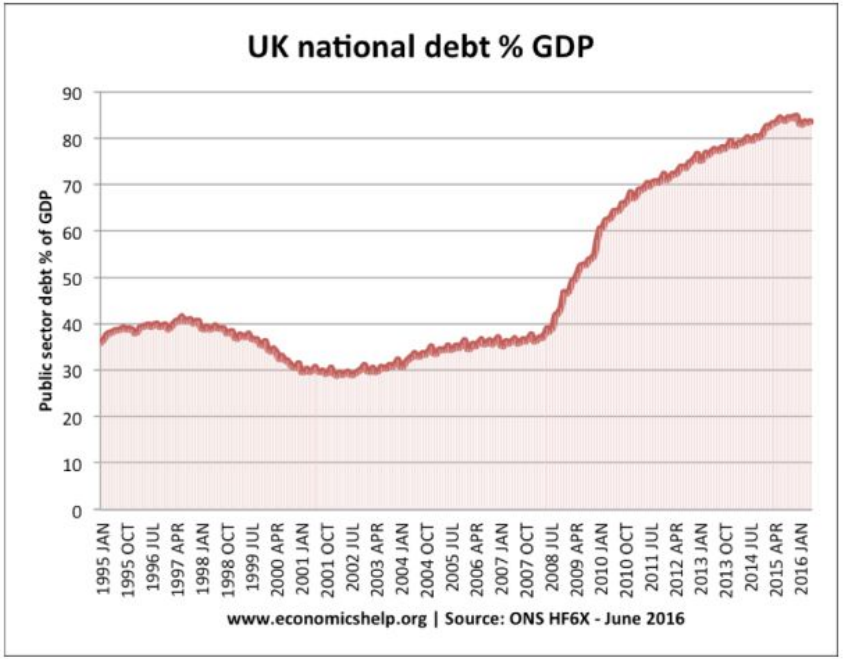
# EXAMPLES OF MALICIOUS DATA VISUALIZATION

**Truncating the graph:**

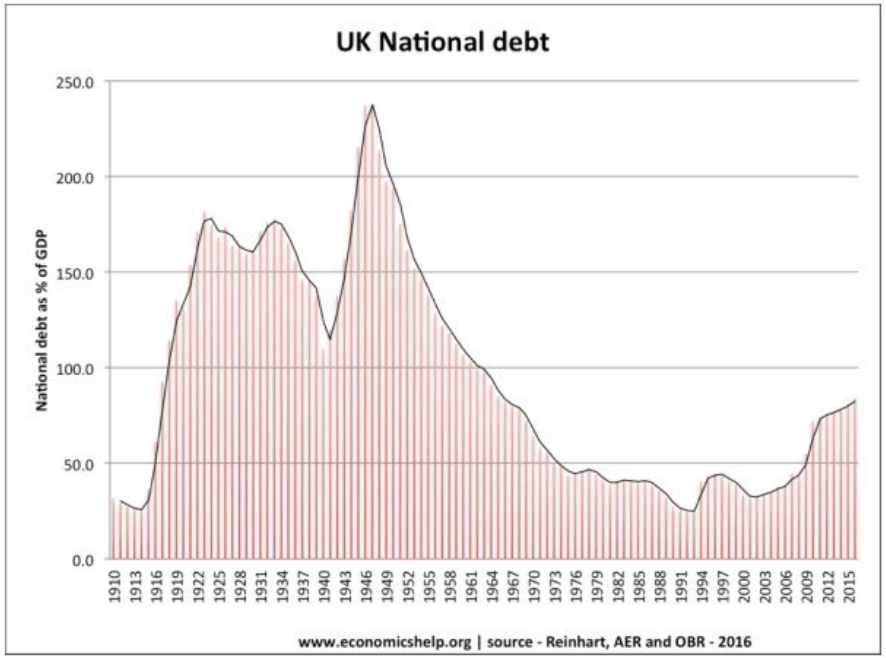


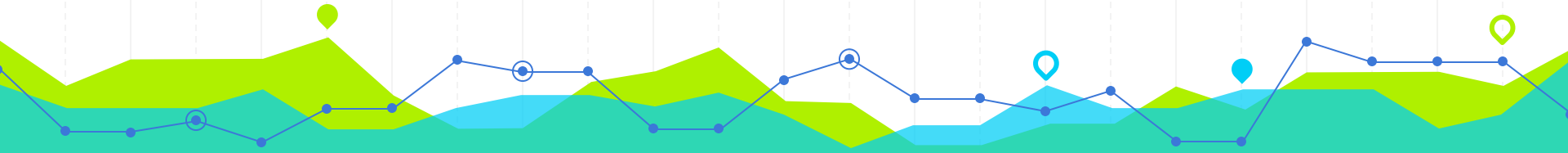
# EXAMPLES OF MALICIOUS DATA VISUALIZATION




Source: www.economicshelp.org




Source: www.economicshelp.org



# DATA VISUALIZATION IN JAVASCRIPT

# 4

# Chart.js

# THANKS!

## Any questions?

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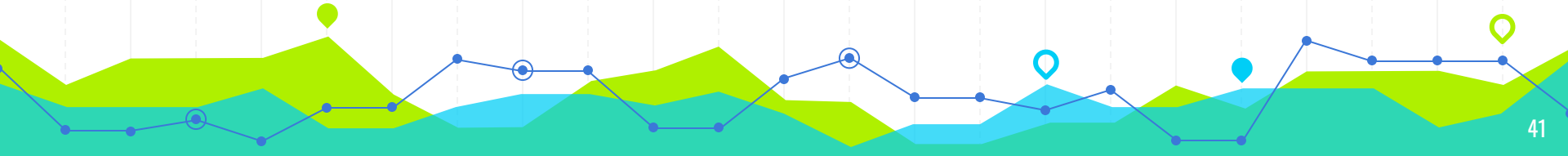

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