GENERAL ASSEMBLY

UNDERSTANDING YOUR DATA:

CORRELATION

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UNDERSTANDING YOUR DATA: CORRELATION

Learning Objectives

At the end of this module you will be able to:

- Describe what correlation is and provide an example of positive and negative correlation
- Be able to complete this phrase “Correlation does not imply ____!”
- Use Pandas to look at the data, create a plot of the data and determine the correlation coefficient

AGENDA

- What is correlation
- Measuring correlation with “the correlation coefficient”
- Determining the level of correlation in a dataset using Pandas
  - Example using Pandas commands on ice-cream data
  - Exercise: determining the level of correlation between variables in the “cars” data set

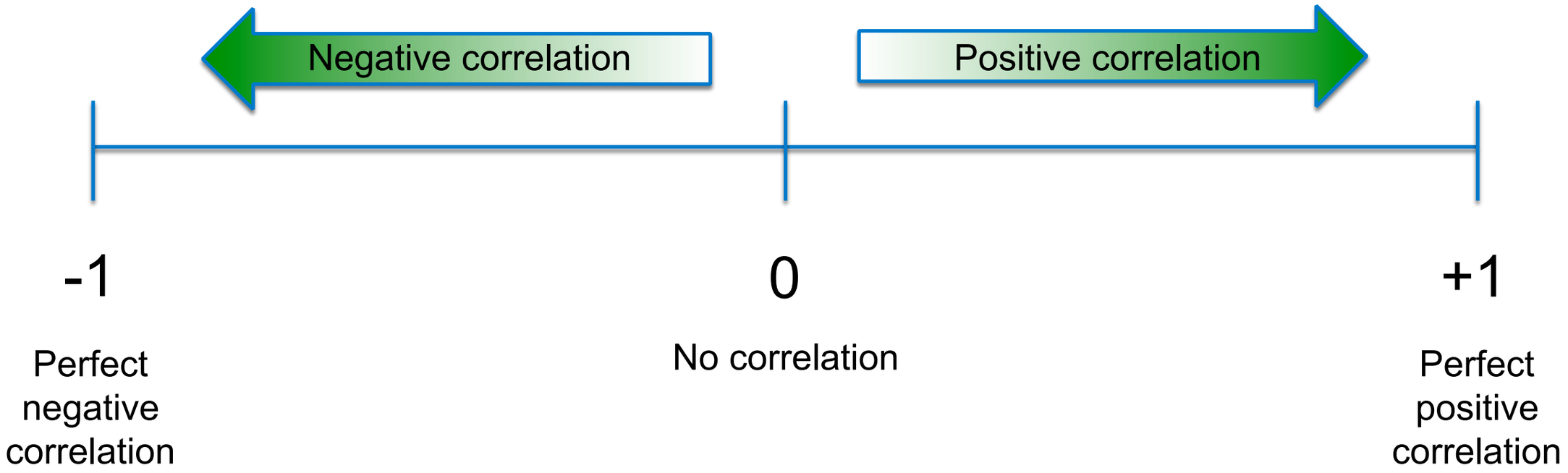
CORRELATION

- **Correlation measures the extent of linear interdependence of two variables**
  - If two variables are correlated, then when the value of one moves the value other tends to also move

- Positively correlated
  - “When the temperature goes up, ice cream sales tend go up”
  - “When ice cream sales go up, the temperature tends to be higher
- Negatively correlated - “When car weight goes up, gas mileage tends to go down”

MEASURING CORRELATION

Pearson's *correlation coefficient* is a commonly used measure of correlation



CORRELATION COEFFICIENT

Positive, negative or no correlation?

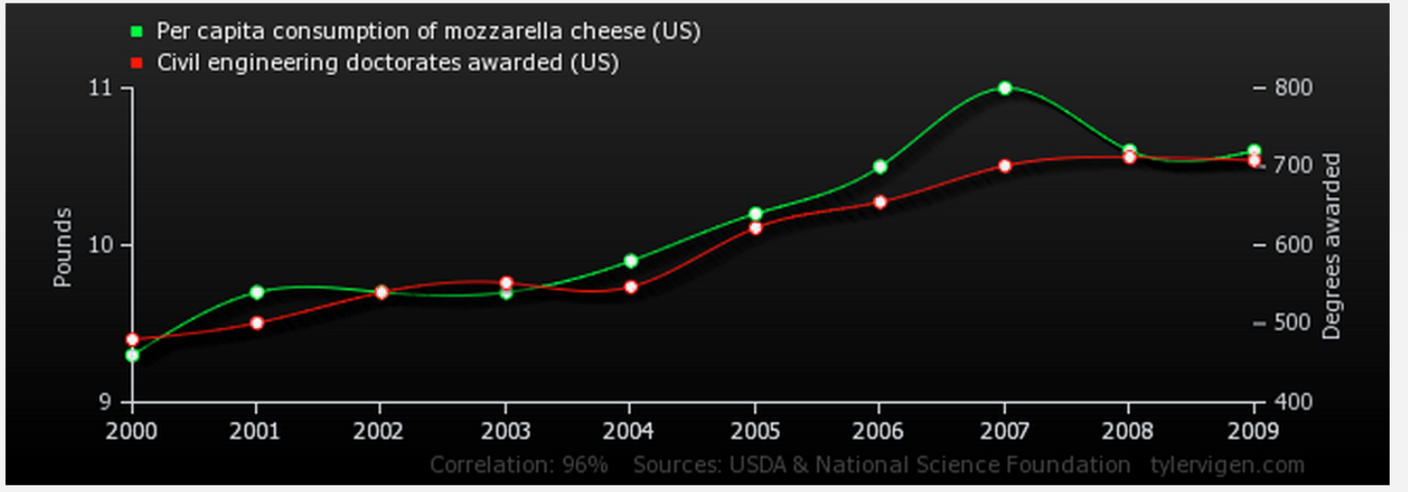
- “When the temperature goes up, ice cream sales go up”
- “When beef price rises, steak sales go down”
- Per capita consumption of mozzarella cheese (US), Civil engineering doctorates awarded (US)

SURPRISING CORRELATIONS CAN OCCUR

Per capita consumption of mozzarella cheese (US)

correlates with

Civil engineering doctorates awarded (US)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Per capita consumption of mozzarella cheese (US) *Pounds (USDA)*	9.3	9.7	9.7	9.7	9.9	10.2	10.5	11	10.6	10.6
Civil engineering doctorates awarded (US) *Degrees awarded (National Science Foundation)*	480	501	540	552	547	622	655	701	712	708

Correlation: 0.958648

Source: Spurious Correlations, http://tylervigen.com/spurious-correlations

CORRELATION DOES NOT IMPLY CAUSATION!

- We *cannot* tell from correlation that there is a cause and effect relationship between two variables
  - Example: A study provides data where health and mood are correlated
    - but improved mood could cause better health, or better heath may cause better mood, they both could be caused by a third factor, or it is just coincidence
- However, a strong correlation can inform us that there *may* be a cause and effect relationship between two variables

CORRELATION ONLY MEASURES THE LINEAR RELATIONSHIP

- It may not reveal relationships between variables that are non-linear

- https://stt.msu.edu/Academics/ClassPages/uploads/SS16/231-1/Summary%20Linear%20Models.pdf

USING PANDAS TO EVALUATE CORRELATION

- Example using the ice cream data set
- List data
- Plot data
- Calculate correlation coefficients in a correlation matrix

- Exercise using the built in “car” data set of speeds and stopping distances

TODAY WE LEARNED

- That correlation measures the extent of interdependence of two variables
- How to measuring correlation with “the correlation coefficient”
- That correlation does not = cause and effect
- How to determine the level of correlation in a dataset using Pandas

QUESTIONS?