YData: An Introduction to Data Science

Lecture 29: Correlation

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Announcements

Prediction

Guessing the Future

- Based on incomplete information

- One way of making predictions:
  - To predict an outcome for an individual,
  - find others who are like that individual
  - and whose outcomes you know.
  - Use those outcomes as the basis of your prediction.

Association

Two Numerical Variables

- Trend
  - Positive association
  - Negative association
- Pattern
  - Any discernible “shape” in the scatter
  - Linear
  - Non-linear

Visualize, then quantify

(DEMO)

Correlation Coefficient

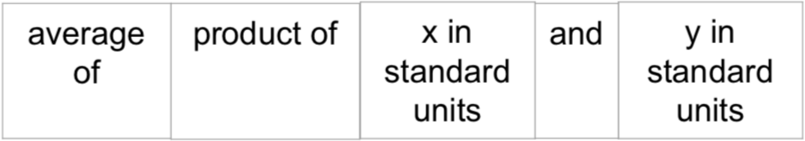
The Correlation Coefficient r

- Measures **linear** association
- Based on standard units
- -1 $\leq$ r $\leq$ 1
  - r = 1: scatter is perfect straight line sloping up
  - r = -1: scatter is perfect straight line sloping down
- r = 0: No linear association; <u>uncorrelated</u>

(DEMO)

Definition of *r*

Correlation Coefficient (r) =



average of	product of	x in standard units	and	y in standard units

Measures how clustered the scatter is around a straight line

Watch Out For ...

- Nonlinearity
- Outliers
- Ecological Correlations