



Lecture 7

Charts

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Announcements

Census Review

The Decennial Census

- Every ten years, the Census Bureau counts how many people there are in the U.S.
 - In between censuses, the Bureau estimates how many people there are each year.
 - Article 1, Section 2 of the Constitution:
 - “Representatives and direct Taxes shall be apportioned among the several States ... according to their respective Numbers ...”
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Census Table Description

- Values have column-dependent interpretations
 - The SEX column: 1 is *Male*, 2 is *Female*
 - The POPESTIMATE2010 column: *7/1/2010 estimate*
- In this table, some rows are sums of other rows
 - The SEX column: 0 is *Total (of Male + Female)*
 - The AGE column: 999 is *Total* of all ages
- Numeric codes are often used for storage efficiency
- Values in a column have the same type, but are not necessarily comparable (AGE 12 vs AGE 999) (Demo)

Growth Rate

- Growth rate = g (for example 3%, or 0.03)
- Initial value x , final value y after t periods of time

$$\text{Value after 1 period} = x + xg = x * (1+g)$$

$$\text{Value after 2 periods} = x(1+g)(1+g) = x * (1+g) ** 2$$

$$\text{Value after } t \text{ periods} = y = x * (1+g) ** t$$

$$\text{So } (1+g) ** t = y/x \text{ and so } 1+g = (y/x) ** (1/t)$$

$$\text{So } \mathbf{g = (y/x) ** (1/t) - 1}$$

Data Visualization

Types of Data

All values in a column should be both the same type **and** be comparable to each other in some way

- **Numerical** — Each value is from a numerical scale
 - Numerical measurements are ordered
 - Differences are meaningful
 - **Categorical** — Each value is from a fixed inventory
 - May or may not have an ordering
 - Categories are the same or different
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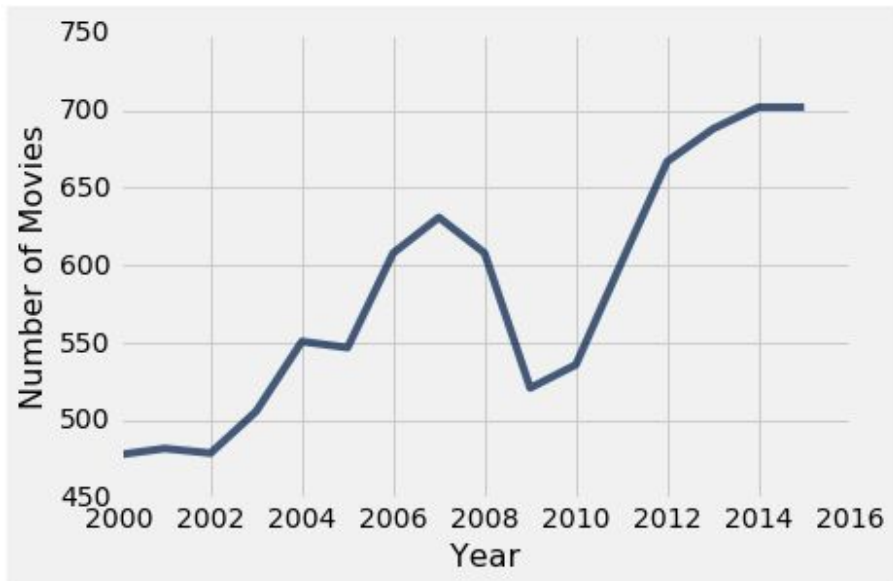
“Numerical” Data

Just because the values are numbers, doesn't mean the variable is numerical

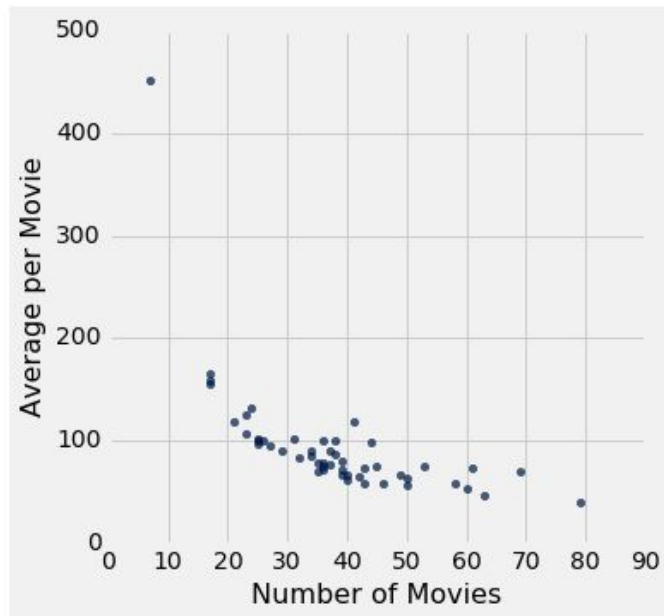
- Census example had numerical `SEX` code (0, 1, and 2)
 - It doesn't make sense to perform arithmetic on these “numbers”, e.g. $1 - 0$ or $(0+1+2)/3$ are meaningless
 - The variable `SEX` is still categorical, even though numbers were used for the categories
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Plotting Two Numerical Variables

Line graph: `plot`



Scatter plot : `scatter`



Anthony Daniels,
actor



<https://en.wikipedia.org/wiki/C-3PO>