Class Notes

This time: regression
Next time: regression

Reading: FPP Ch 10, 11/2
HW 6 (p 125-13) due Mon, Jun 12 at 4 pm at exam review (4-6 pm)
in Helen Theatre

Emergency alternate final exam, fill out form in front of class today! (Do not yet circulate)

Case study 181 - Regression

Regression line: *smooths out the graph of averages

* by Galton, 1878
* slope = \( r \times \frac{S_y}{S_x} = \beta \)
  - best line for predicting y from x

Equation of the regression line:
(predicted y value) = (intercept) + (slope) \( \times \) (x value)

\[
\hat{y} = a + \beta x
\]

2 ways to make a regression prediction

1) 70 1/2 inch tall person \( \Rightarrow 70 \frac{1}{2} - 68 = 1 \) SD above average
   corresponds to \( r \times (15) = 0.36 \times 15 = 5.4 \times 2.5 = 9 \) lb over

\[
158 + 9 = 167 \text{ lb}
\]
2) Work out slope, intercept of regression line, plug in the \( x \), see what \( y \) value results.

The regression line has slope \( \hat{b} = \frac{\hat{a}}{\hat{a}^2} \) and goes through \((x, \hat{y})\).

This determines \( y \)-intercept:

\[
\hat{y} = \hat{a} + \hat{b} \cdot x
\]

This gives:

\[
\hat{a} = \hat{y} - \hat{b} \cdot x
\]

\[
\hat{a} = 158.1b - \hat{r} \left( \frac{\hat{a}}{\hat{a}^2} \right) \cdot 68 \text{ in}
\]

\[
\hat{a} = 158.1b - .36 \left( \frac{25}{23} \right) \cdot 68 \text{ in}
\]

\[
\hat{a} = -86.8 \text{ in}
\]

\( y \)-intercept

So, plug in 70.5 in for \( x \)

\[
\hat{y} = -86.8 + 3.6 \times 70.5
\]

\[
\hat{y} = 167 \text{ lb}
\]

with \( \text{SE} ( \hat{y} ) = S_y \cdot \sqrt{1 - r^2} \)