THIS TIME: REGRESSION

READ: FPP Ch. 10, 11, 12

HWK 6 (READER pp. 125 - 133) DUE MON

12 JUN 4PM AT FINAL EXAM REVIEW: 4-6 PM MON 12 JUN IN MEDIA THEATER M110

EMERGENCY ALTERNATE FINAL EXAM: YOU MUST SIGN SHEET AT FRONT OF CLASS TO MAKE ALTERNATIVE ARRANGEMENTS (EMAIL NOT ENOUGH)

CS 18 REGRESSION

SD LINE (PASSES THROUGH $\bar{x}, \bar{y}$) BUT WITH SLOPE $\frac{s_y}{s_x}$

THE LINE THAT SMOOTH OUT THE GRAPH OF AVE. IS CALLED THE REGRESSION LINE (GALTON, 1890)

& ITS SLOPE IS $b = r \frac{s_y}{s_x}$ & SLOPE OF BEST LINE FOR PREDICTING $y$ FROM $x$
EQUATION OF REGRESSION LINE

\[
(\text{Y VALUE}) = (\text{INTERCEPT}) + (\text{SLOPE})(\text{VALUE})
\]

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

2 WAYS TO MAKE A REGRESSION PREDICTION:

1. THIS GUY IS 70.5 IN TALL = \[
\frac{70.5 - 68}{2.5} = 1
\]
   \text{IN} \rightarrow \text{HE IS 1 SD ABOVE AVE IN HT} \rightarrow \text{WE PREDICT HE WILL ONLY BE 0.1 SD ABOVE AVE IN WT} = (0.36)(1) = 0.36 \text{ SD ABOVE AVE IN WT} = (0.36)(625 \text{ LB}) = 9 \text{ LB ABOVE AVE} + 158 \text{ LB} + 9 \text{ LB} = 167 \text{ LB}

2. WORK OUT SLOPE, INTERCEPT OF REG. LINE, Plug in the X, SEE WHAT Y VALUE RESULTS.
REG. LINE
SLOPE \( \frac{\Delta y}{\Delta x} = \frac{3}{5} \)
\[ b = \frac{\Delta y}{\Delta x} \]
\[ \text{GOES THROUGH} \ (x, y) \rightarrow \]
DETERMINES \( y \)-INTERCEPT:

\[ y \rightarrow y + b \cdot x \]
\[ \frac{\Delta y}{\Delta x} \rightarrow y - b \cdot x \]

\[ y = b_0 + b \cdot x \]
\[ \frac{\Delta y}{\Delta x} = b_0 + b \cdot x \]

HERE \( b = \frac{\Delta y}{\Delta x} = ( +0.36 \cdot \frac{25 \text{ LB.}}{2.5 \text{ IN}} = 3.6 \cdot \left( \frac{\text{LB.}}{\text{IN}} \right) \]

\[ \Rightarrow \] \[ y = \frac{158 \text{ LB} - (3.6 \cdot \left( \frac{\text{LB.}}{\text{IN}} \right)) \cdot (6 \cdot \text{IN})}{86.8 \text{ LB}} \]

\[ \text{DON'T WORRY IF Y-INTERCEPT IS SILLY} \]
\[ \text{OFTEN IT INVOLVES AN ENORMOUS EXTRAPOLATION} \]
\[ \text{FROM DATA}. \]
\[ y = (-86.8 \text{ LB}) + (8.6 \frac{\text{ LB}}{\text{m}})(70.5 \text{ m}) \]

\[ = 25.38 \text{ LB} \]

\[ = 167 \text{ LB} \]

**GIVE OR TAKE HOW MUCH?**

**IGNORE \( x \), PREDICT**

\[ y : \hat{y} = \hat{y}, \text{ GIVE OR TAKE } = s_{\hat{y}} \]

**USE \( x \), PREDICT**

\[ y : \hat{y} = \hat{y} + b \hat{x}, \text{ GIVE OR TAKE SHOULD BE SMALLER THAN } \]

\[ s_{\hat{y}} : \text{SE}(\hat{y}) = s_{\hat{y}} \sqrt{1 - r^2} \]