

To obtain the lowess estimates lowess \pm SD:

Notation: To distinguish estimates from parameters or true values, we'll use a hat (^) over estimates.

1. Smooth to get the lowess estimate $\hat{E}(y|x)$ of $E(y|x)$.

2. Let

$$\hat{e}^2 = [y - \hat{E}(y|x)]^2 \text{ -- the "squared residual"}$$

It's an estimate of $[y - E(y|x)]^2$

Recalling the definition of Var, we can consider

$$E(\hat{e}^2|x)$$

as an estimate of $\text{Var}(y|x)$.

3. Use smoothing to get an estimate $\hat{E}(\hat{e}^2|x)$ of $E(\hat{e}^2|x)$

$$4. \widehat{SD} = \sqrt{\hat{E}(\hat{e}^2|x)}$$