Curve Fitting

Part-11

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Least Square fit ; a st. line

We have set of data $\{(x_i, y_i)\}$, we want to fit best st. line, given by $y = ax + b$

Then we have seen that

$$b = \frac{1}{N}\sum y_i - \frac{a}{N}\sum x_i$$

$$b = \bar{y} - a\bar{x} \qquad \bar{x} = \frac{1}{N}\sum x_i \qquad \bar{y} = \frac{1}{N}\sum_i y_i$$

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n\sum x^2 - (\sum x)^2}$$

$$a = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

$$y = ax + b$$

Simulation

1. We don't have real data to work with!

2. First we generated a data set with known st.line, i.e. known $a = a_i$ and $b = b_i$, add noise (Gaussian random number with known $\sigma^2 = \sigma_i^2$).

3. We run the Least square algorithm on the data set, estimate $a = a_o$ and $b = b_0$ for model $y = a\,x + b$, compare with the original input a_i and b_i

4. Compute the error i.e $\sigma^2 = \sigma_o^2$ and compare with σ_i^2