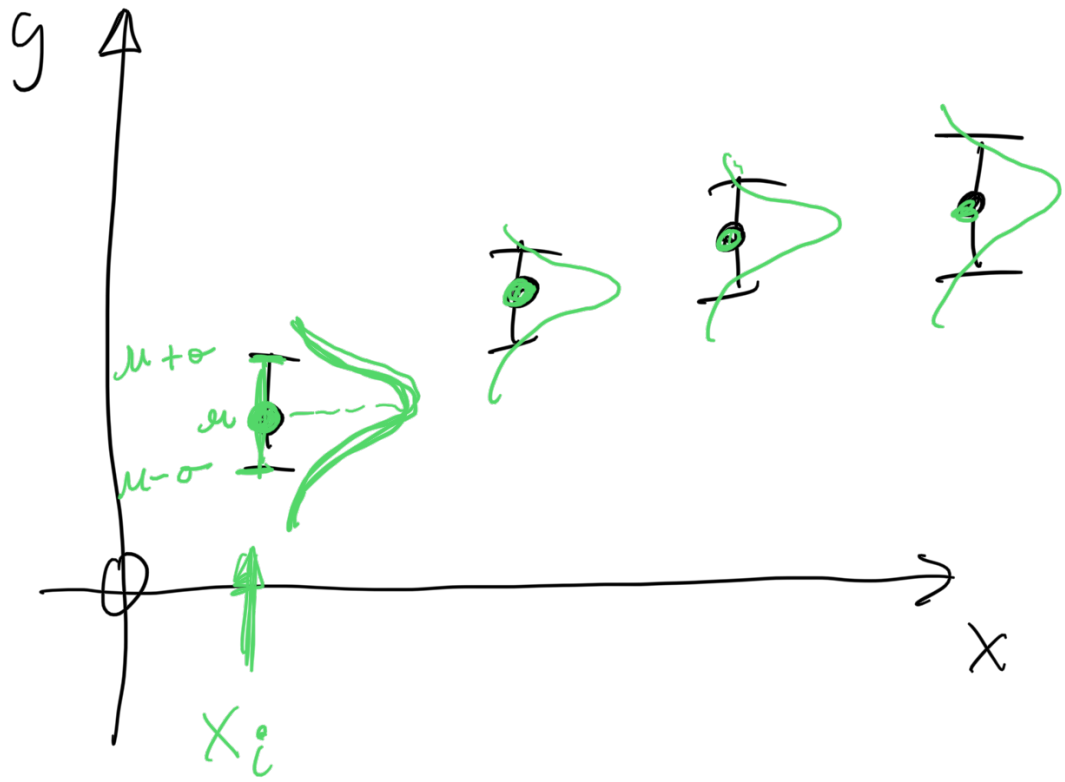
Physics 421 / PCSE 503

Fitting Data



Ordinary Least Squares.

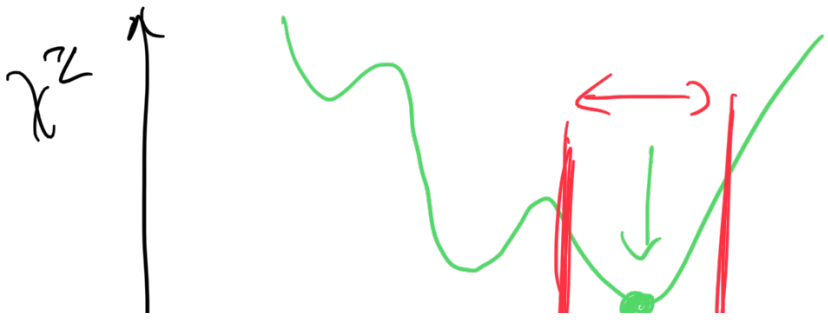
$$\chi^2 \equiv \sum_{i=1}^{N} \left(y_i - y_{fit}(x_i) \right)^2$$

$a, b, c, \ldots$

$$\frac{\partial \chi^2}{\partial a} = 0 \quad , \quad \frac{\partial \chi^2}{\partial b} = 0 \quad , \ldots$$

χ^2 - minimization

$$y_{fit} = a + bx + cx^2 + \ldots$$



$$\chi^2 \equiv \sum_{i=1}^{N} \left(\frac{y_i - y_{fit}(x_i)}{\sigma_i^2} \right)^2$$

If σ_i is small, χ_i^2 big

If σ_i is big, χ_i^2 small

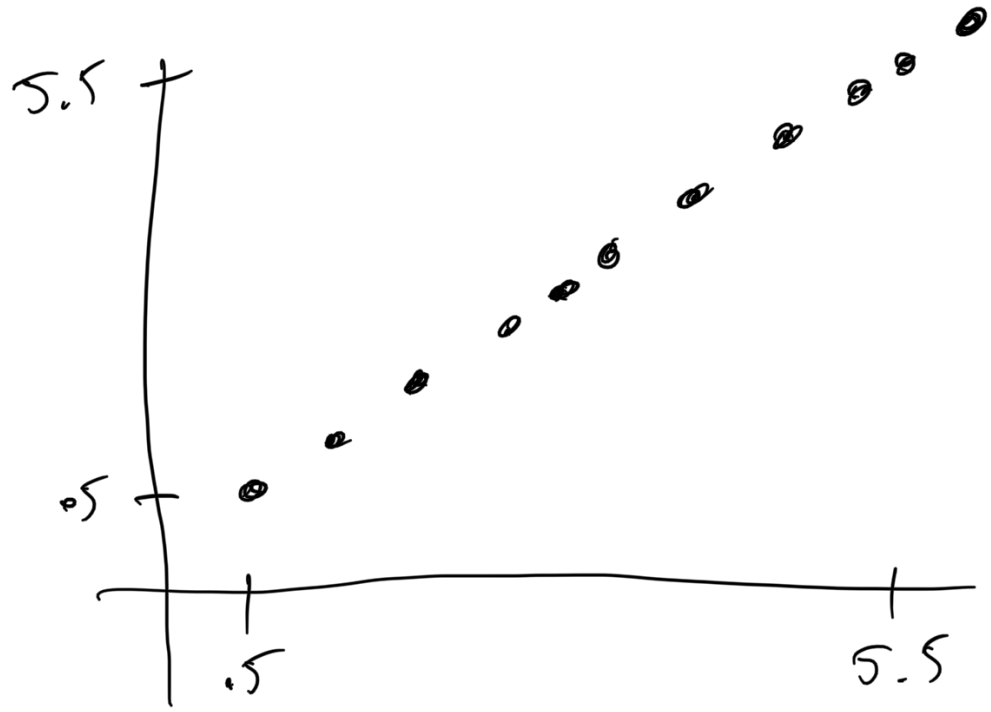
$$\frac{\partial^2 \chi^2}{\partial a} = 0, \quad \frac{\partial \chi^2}{\partial b} = 0, \ldots$$

Fake Data

$y = x$

$$m = 1$$

$$y_{int} = 0$$



$$popt = \begin{bmatrix} a & , & b \\ =0 & & =1 \end{bmatrix}$$

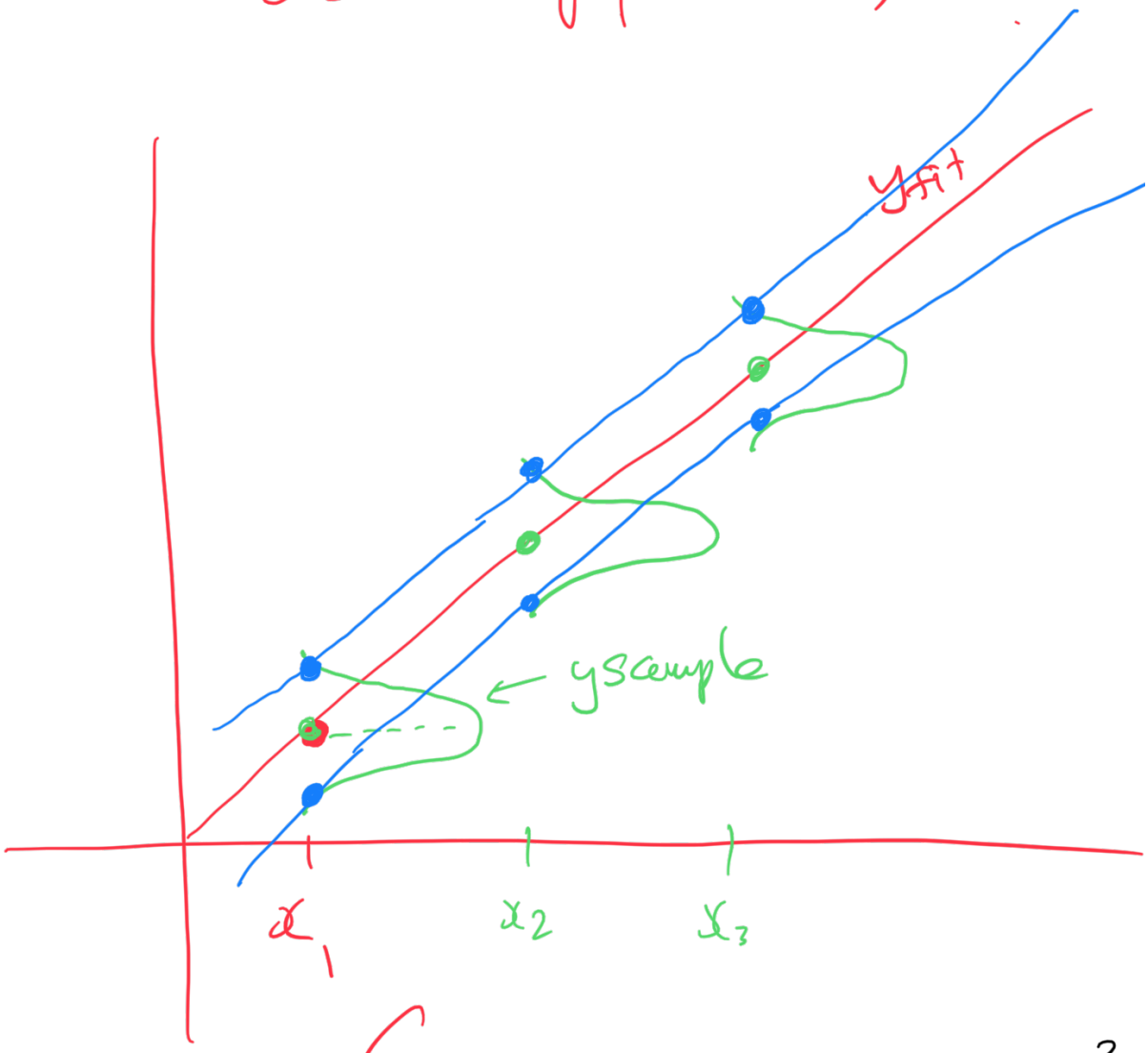
$$y_{fit} = a + bx$$

$$pcov = \begin{bmatrix} & & \\ & & \end{bmatrix}$$

$$\begin{bmatrix} \square & \square \end{bmatrix}$$

$$\delta a = \sqrt{pcov(0,0)}$$

$$\delta b = \sqrt{pcov(1,1)}$$

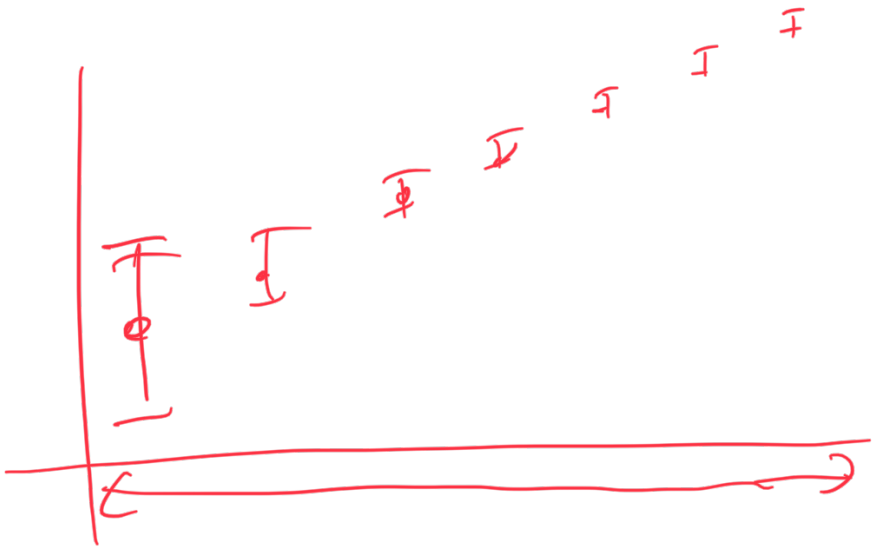


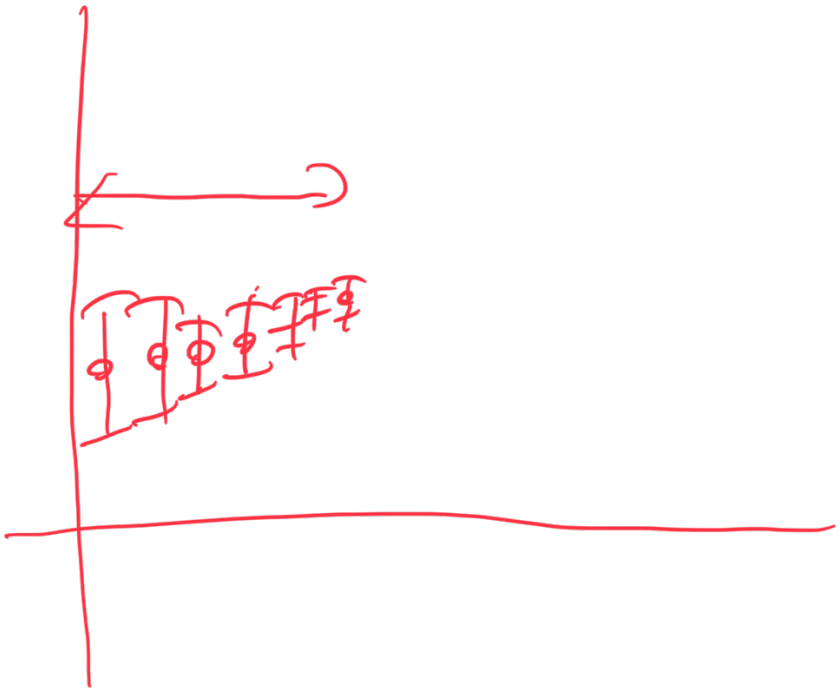
C

$$\chi^2 = \left(\frac{1}{(n-5)^2}\right) \sum_{i=1}^{N} \frac{\left(y_i - y_{fit}(x_i)\right)^2}{\sigma_i^2}$$

$(5)^2$

$$\frac{\partial \chi^2}{\partial a} = 0, \quad \frac{\partial \chi^2}{\partial b} = 0$$





original