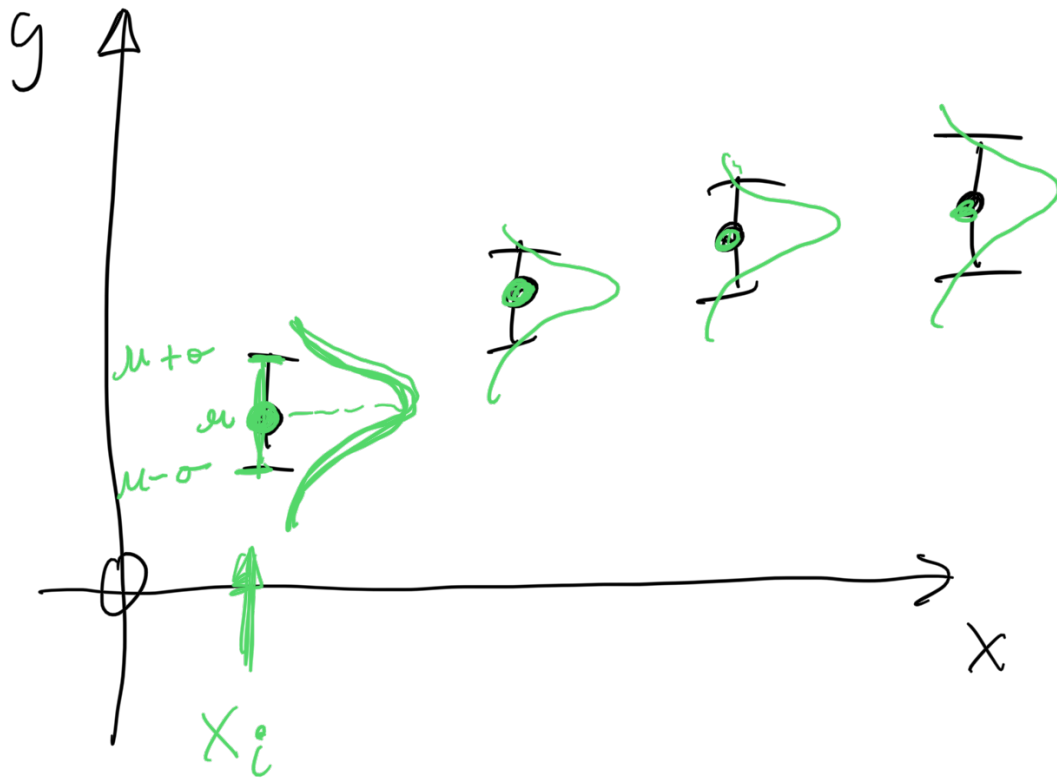


Physics 421 / PCSE 503

Fitting Data



Ordinary Least Squares.

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

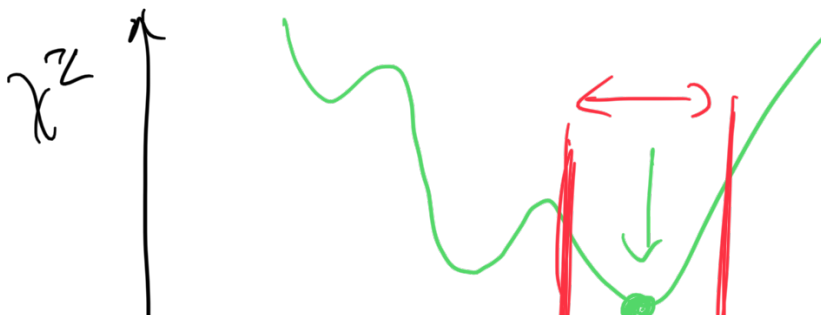
↑
a, b, c, ...

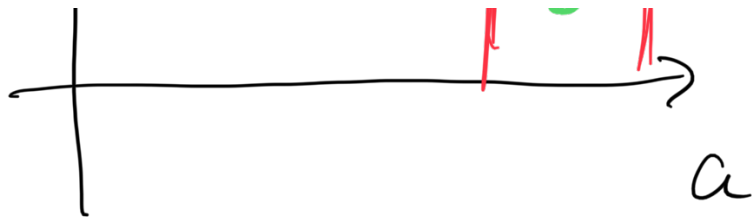
$$\frac{\partial \chi^2}{\partial a} = 0, \quad \frac{\partial \chi^2}{\partial b} = 0$$

1, ...

χ^2 -minimization

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





$$\chi^2 = \sum_{i=1}^n \left(\frac{y_i - y_{f,7}(x_i)}{\sigma_i^2} \right)^2$$

If σ_i is small, χ_i^2 (big)

If σ_i is big, χ_i^2 (small)

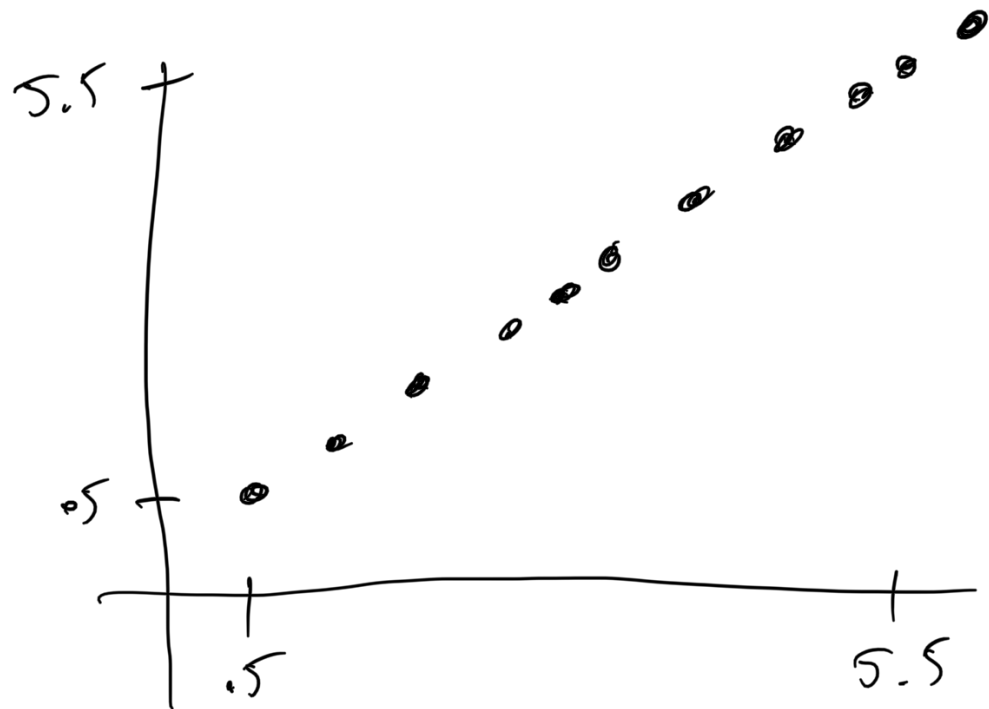
$$\frac{\partial^2 \chi^2}{\partial a} = 0, \quad \frac{\partial \chi^2}{\partial b} = 0, \dots$$

Fake Data

$$y = x$$

1

$$\begin{cases} M = 1 \\ g_{int} = 0 \end{cases}$$



$$p_{opt} = \begin{bmatrix} a & b \end{bmatrix}$$

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

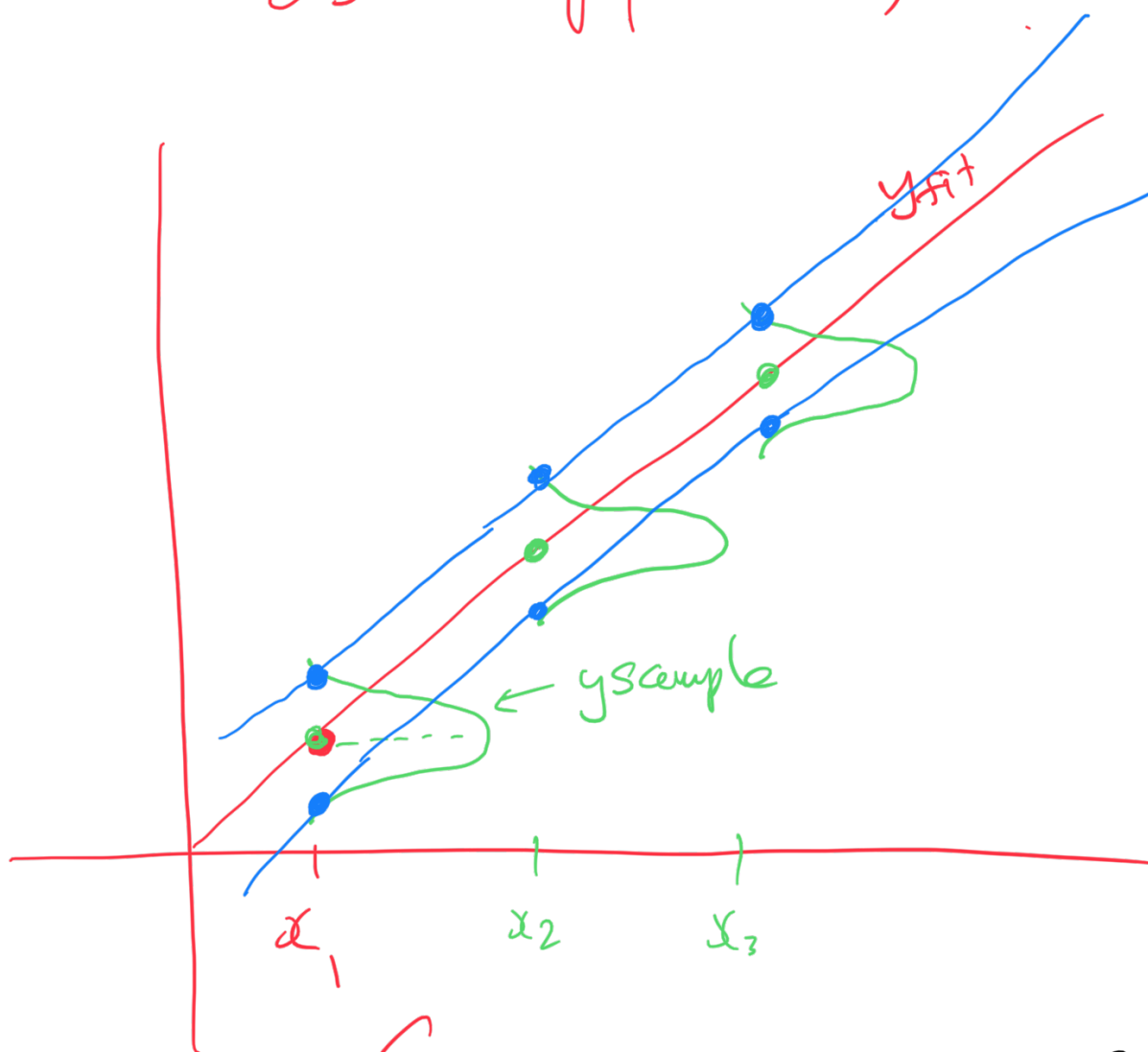
$$p_{cov} = \begin{bmatrix} \boxed{\text{red diagonal}} & \boxed{} \\ \boxed{} & \boxed{\text{red diagonal}} \end{bmatrix}$$

A red arrow points to the top-left element of the covariance matrix, which is a square box filled with red diagonal lines.

[]

$$\delta a = \sqrt{p_{\text{cov}}(0,0)}$$

$$\delta b = \sqrt{p_{\text{cov}}(1,1)}$$

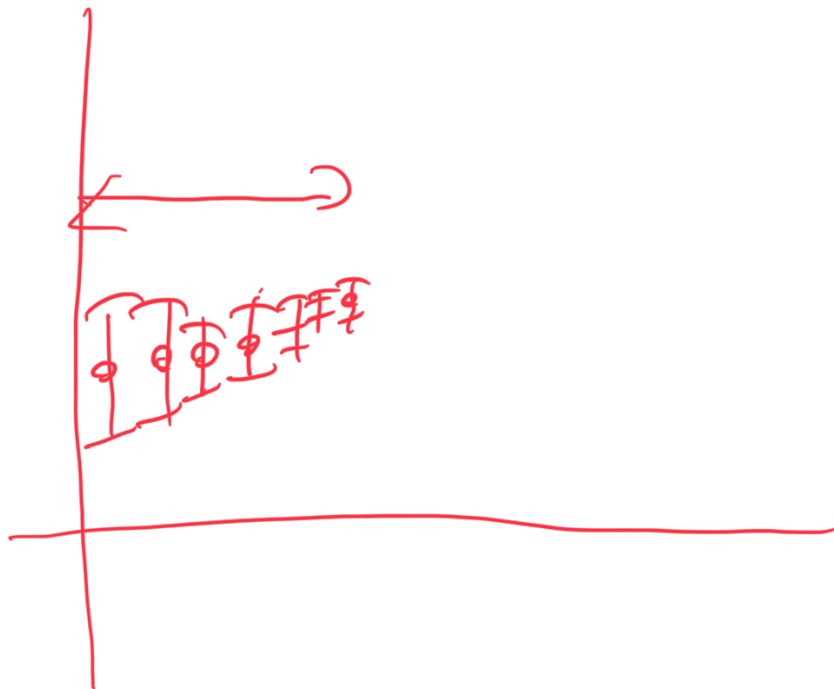
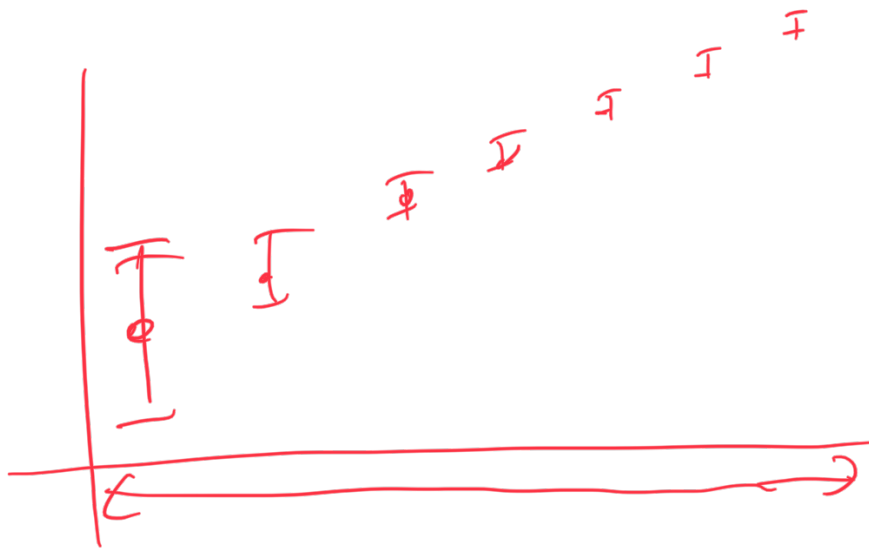


$$\chi^2 = \frac{1}{(1.5)^2} \sum_{i=1}^n \frac{(y_i - y_{\text{fit}}(x_i))^2}{\sigma_i^2}$$

1

$$(0.5)^2$$

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



original



