Least Squares

- For a given regression line (red line)
  - compute for each animal the e_i value
  - square all e_i - values
  - sum squared e_i

$e_i = y_i - b_0 - b_1 x_i$ for example data set: $e_1, e_2, \dots, e_{10}$

$$\underline{e} = \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_{10} \end{bmatrix} \quad ; \quad \text{Compute: } e^T \cdot e = \sum_{i=1}^{N} e_i^2 = \sum_{i=1}^{N} [y_i - b_0 - b_1 \cdot x_i]^2$$

Task: find numeric values for b_0 and b_1 such that $e^T e$ is minimal.

Minimization:
- Compute $\frac{\partial e^T e}{\partial b_0}$; $\frac{\partial e^T e}{\partial b_1}$
- Find $\hat{b}_0$ and $\hat{b}_1$ such that $\frac{\partial e^T e}{\partial b_0} = 0$; $\frac{\partial e^T e}{\partial b_1} = 0$