1 Principle Component and Least Squares

1. Use the function `np.random.multivariate_normal()` to create samples $(x_i, y_i) \in \mathbb{R}^2$ for $i = 1, \ldots, 100$ from a 2-dimensional multivariate normal distribution with mean $\mu := (0, 0)$ and covariance

$$\Sigma := \begin{bmatrix} 1 & 0.7 \\ 0.7 & 1 \end{bmatrix}.$$

2. Solve the least squares problem

$$\min_a \sum_{i=1}^{100} (ax_i - y_i)^2$$

and plot the solution and the data points.

3. Make a principle component analysis of the data $v_i := (x_i, y_i) \in \mathbb{R}^2$ (note $m = 2$ and $n = 100$) and plot the first principle component into the plot of (ii).

Solution: