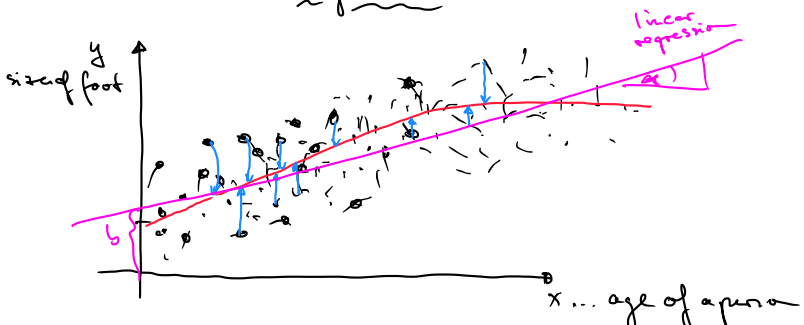
Regression



set of training points (x_i, y_i), $i = 1, \dots, K$

and a e.g. linear function

$$y = mx + b$$

$\Rightarrow$ choose m and b such as to minimize

$$\varepsilon = \sum_{i=1}^{K} (y_i - (mx_i + b))^2 \quad \text{w.r.t. } m \text{ and } b$$

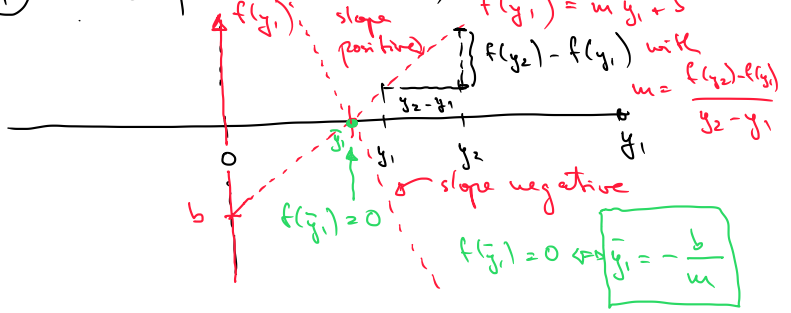
$\Rightarrow \nabla \varepsilon = 0$ with $\nabla = \begin{pmatrix} \frac{\partial}{\partial m} \\ \frac{\partial}{\partial b} \end{pmatrix}$

$\Rightarrow$ solve for m, b

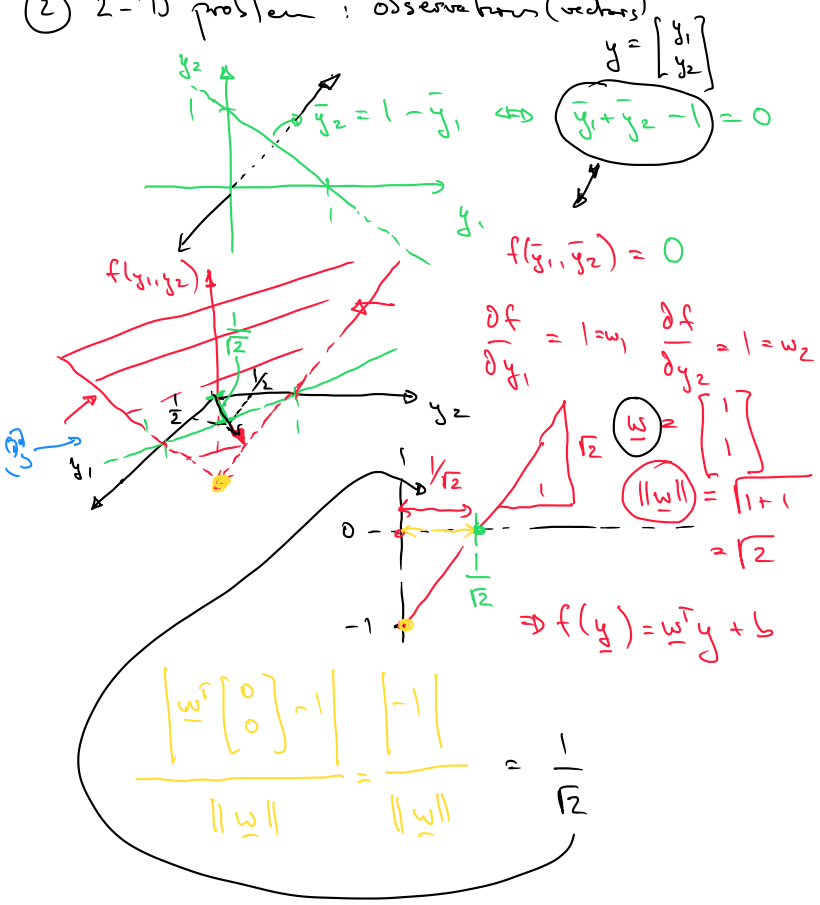
$\Rightarrow$ linear regression

Examples of linear discriminant functions

(1) 1-D problem ($K = 1$): observation y_1



(2) 2-D problem : observations (vectors)



$\underline{w}$ is normal to hyperplane defined by $f(\underline{y}) = 0$

Evaluate $f(\underline{y})$ for $\underline{y}_1$ and $\underline{y}_2$ with both lying on the hyperplane:

$$f(\underline{y}_1) = \underline{w}^T \underline{y}_1 + b = 0$$
$$f(\underline{y}_2) = \underline{w}^T \underline{y}_2 + b = 0$$

$$\Rightarrow \quad \underline{w}^T (\underline{y}_1 - \underline{y}_2) = 0$$