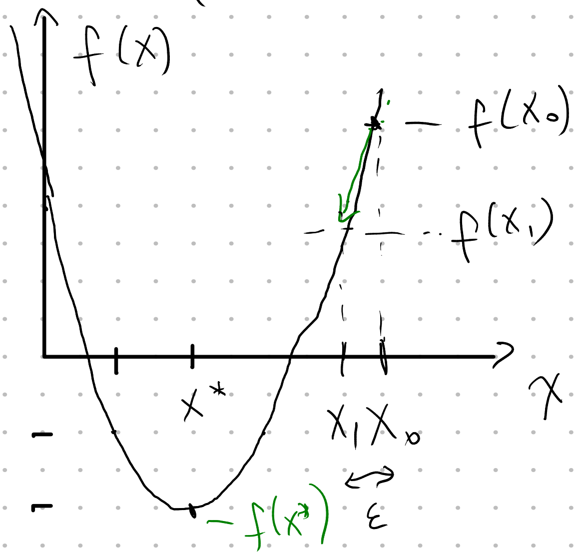
Gradient Descent Method

$$f(x) = x^2 - 4x + 2$$
$$= (x-2)^2 - 2$$



$x_0 \to f(x_0) \to f'(x_0)$

$$f'(x_0) \approx \frac{f(x_0) - f(x_1)}{\varepsilon}$$

$$f'(x_0)\,\varepsilon \approx f(x_0) - f(x_1)$$

$$f(x_1) = f(x_0) - \varepsilon f'(x_0) \quad (1)$$

$$x_0 - x_1 = \varepsilon$$

$$x_1 = x_0 - \varepsilon \quad (2)$$

$\varepsilon = 0.0001$

$x_{ini} = 5$

$f_n = f(x_{ini})$

for in range(100):

 $f_{n+1} = f_n - \varepsilon f'_n$

 $x_{n+1} = x_n - \varepsilon$

 if ($f_{n+1} > f_n$):

  break

return x_n, f_n

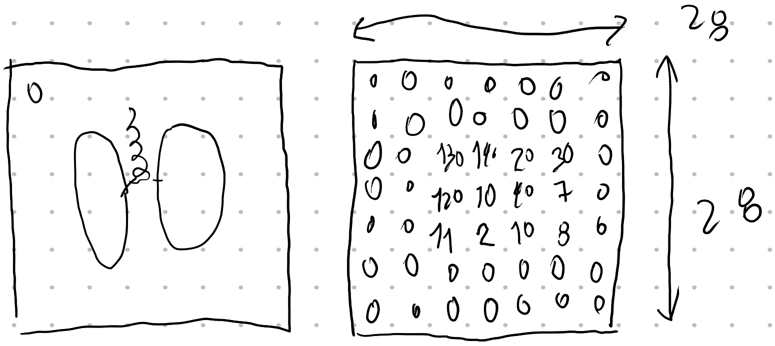
$f(x_1, \cdots, x_n)$

$\vec{\varepsilon} = (\varepsilon, \varepsilon, \cdots, \varepsilon)$

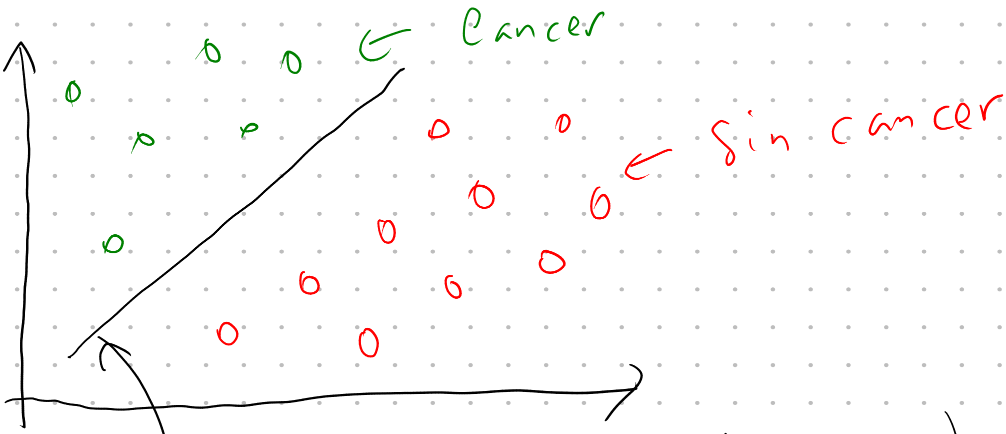
$$\vec{\nabla} f = \left(\frac{\partial f}{\partial x_1}, \cdots, \frac{\partial f}{\partial x_n} \right)$$

$f_{n+1} \to f_n - \vec{\varepsilon} \cdot \vec{\nabla} f$

$\vec{x}_{n+1} = \vec{x}_n - \vec{\varepsilon}$



$[0\ 0 \ldots 130\ 140\ 10\ 0\ 120\ 0\ 0\ 0\ 0] \to 28 \times 28 \quad \mathbb{R}^{764}$



$$w_1 x_1 + w_1 x_2 \cdots + w_n x_n + b = 0$$

aprenden con gradiente descendiente.