

- ① crossValidaties ↴
  - ② dimension reduction
  - ③ Regularisaties
- ↳ L1 & L2
- ↳ L3

Aggregation

↓ Overfitting

↓ overfitting

$$y = 349.97 + 2.0117 x_1 + \underline{30} x_2 + 60 x_3 + 70 x_4$$

↓ after adding  $x_5$

↓ ①

$$y = 349.97 - 1 \cdot 2.0111 + 20 x_2 + 50 x_3 + 60 x_4$$

$$y = 349.97 - 2.00017 x_1 + 20 x_2 + \underline{0 x_3 + 0 x_4}$$

Euklidische Distanz

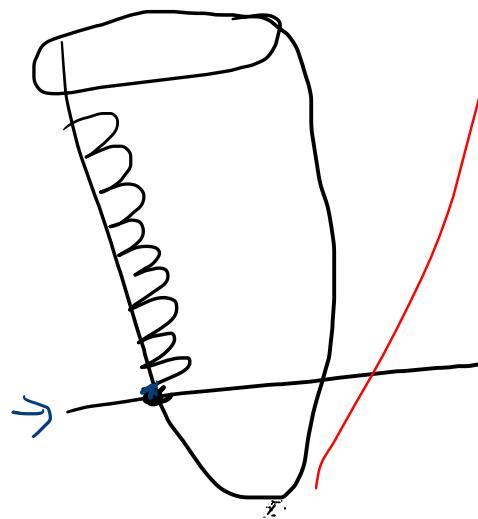
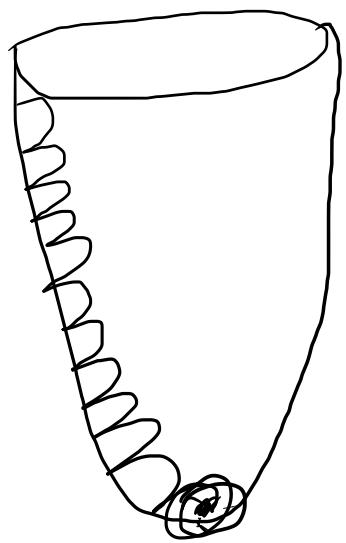
A diagram showing two points on a coordinate system:  $(x_1, y_1)$  at the bottom left and  $(x_2, y_2)$  at the top right. A straight black line segment connects them. To the left of the line, there is a small square.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Manhattan ist fand ab

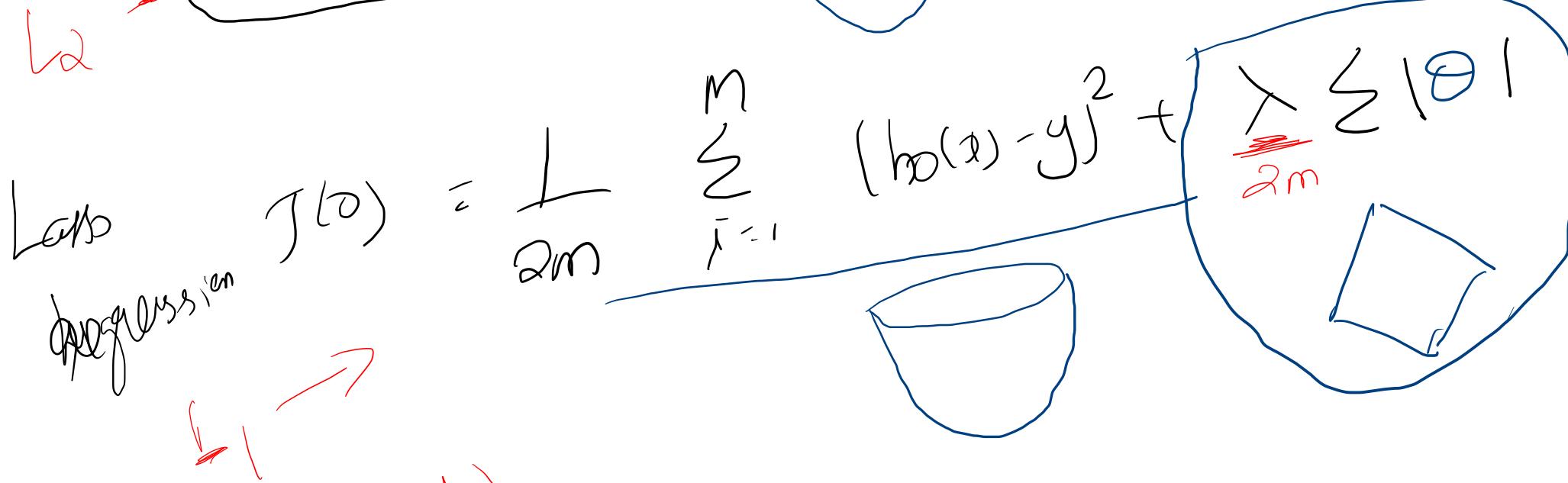
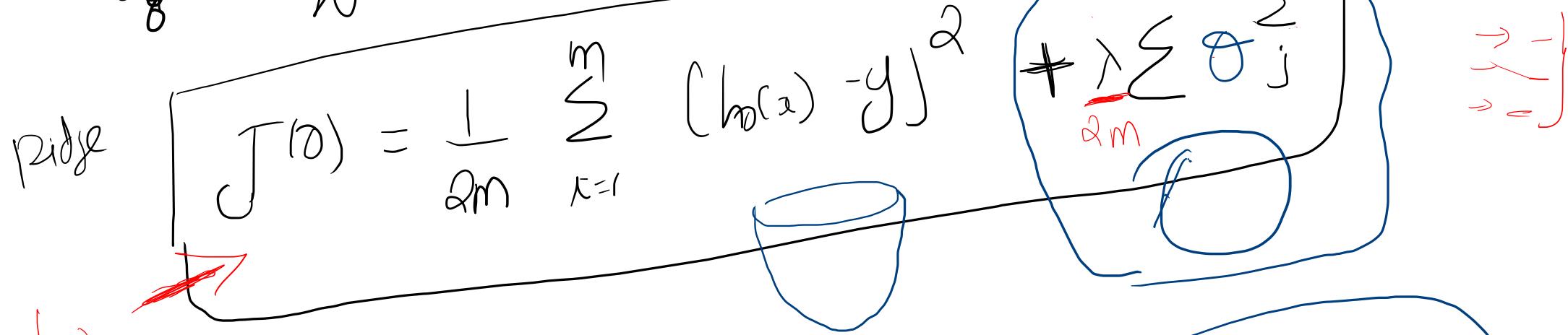
$$d = |x_2 - x_1| + |y_2 - y_1|$$

Euclid

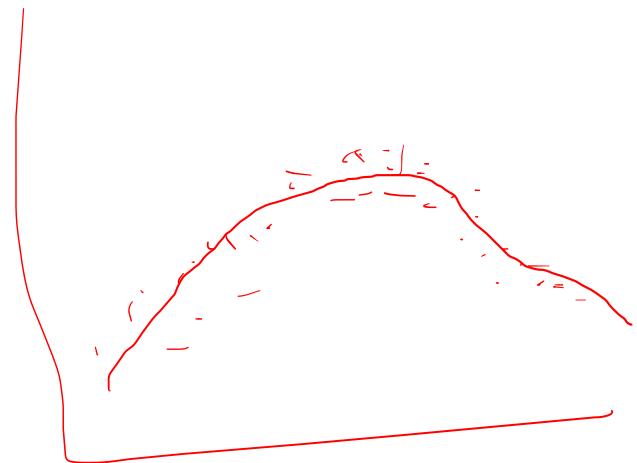
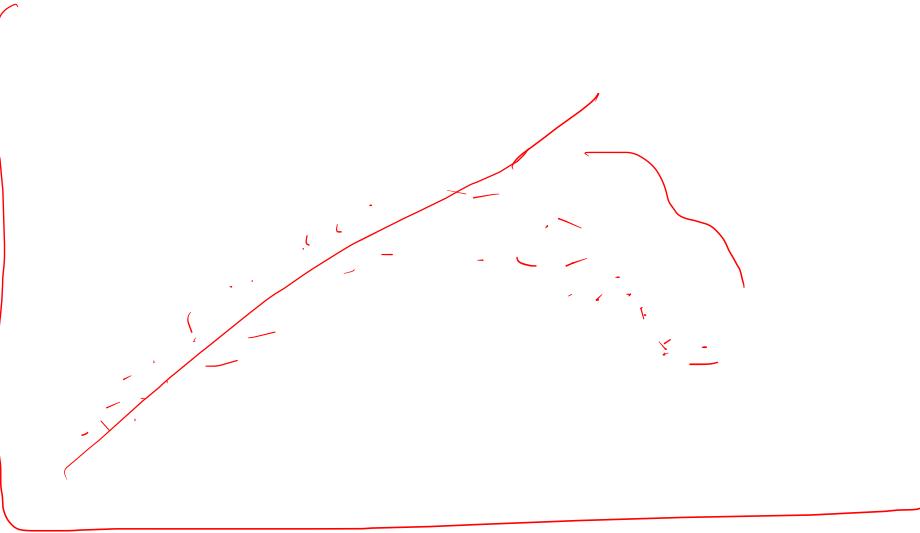


$L_1$  ← Manhattan distance  $\rightarrow$  Lasso  $\rightarrow$  least absolute shrinkage and selection Operator  
 $L_2$  ← Euclidean distance  $\rightarrow$  Ridge  $\rightarrow$  Square Magnitude of coefficient

$\theta_0 \rightarrow$  coefficient -

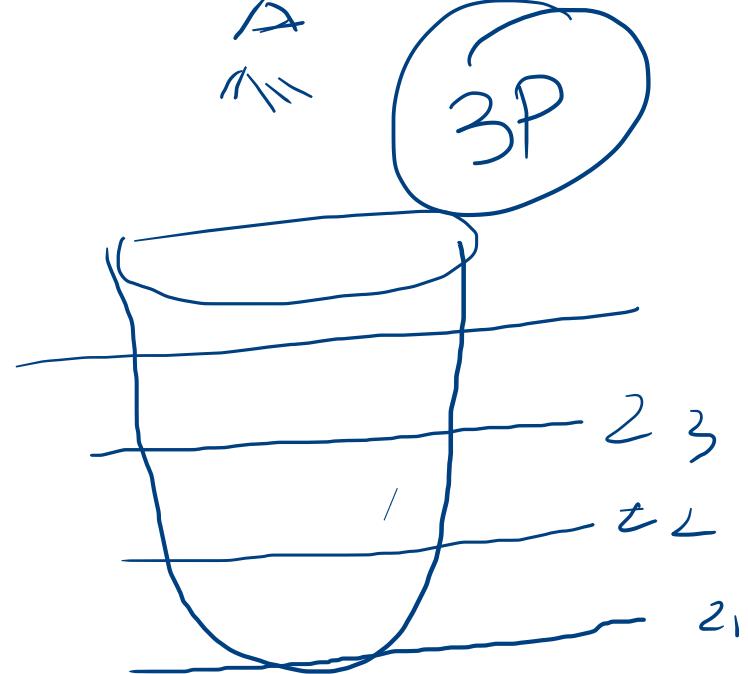
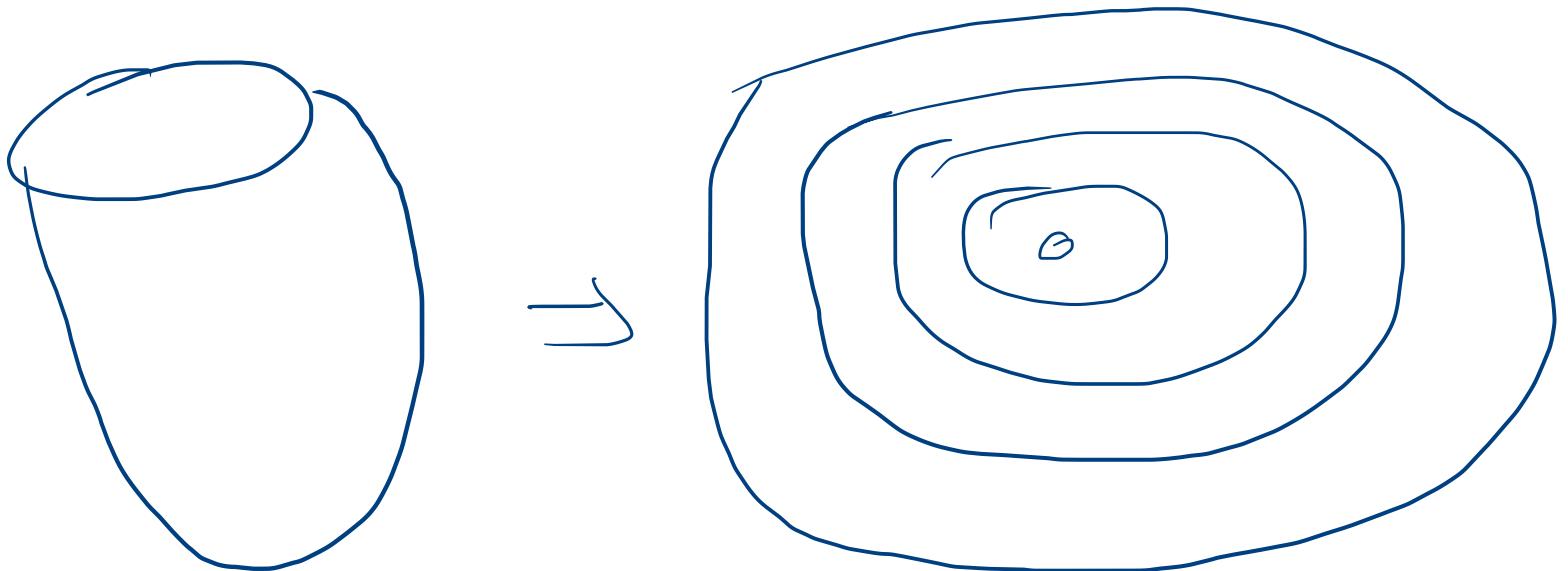


(Sparse coefficient)



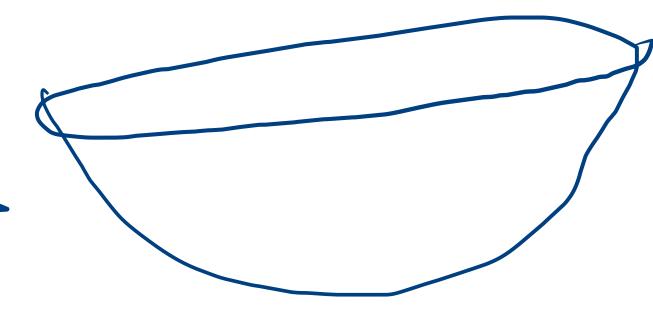
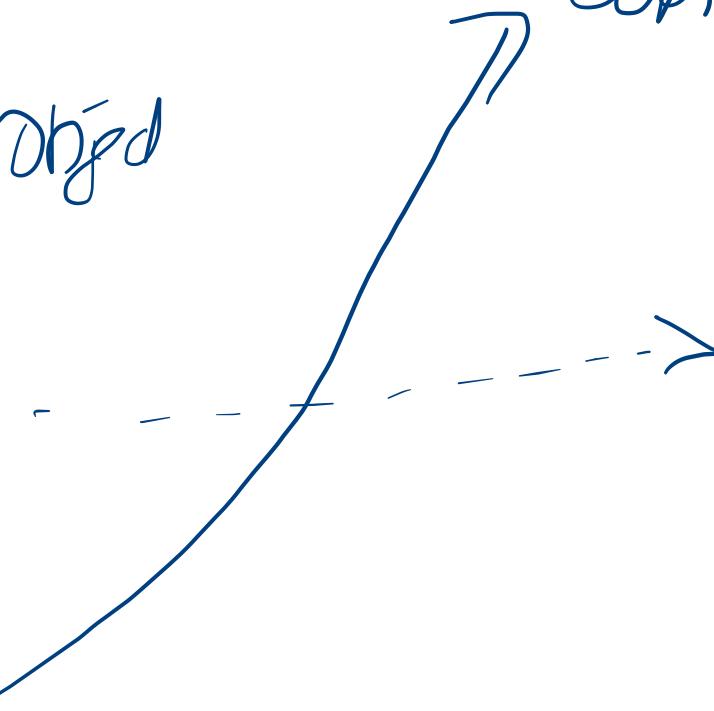
dynamic grey

How to get contours  
pbr

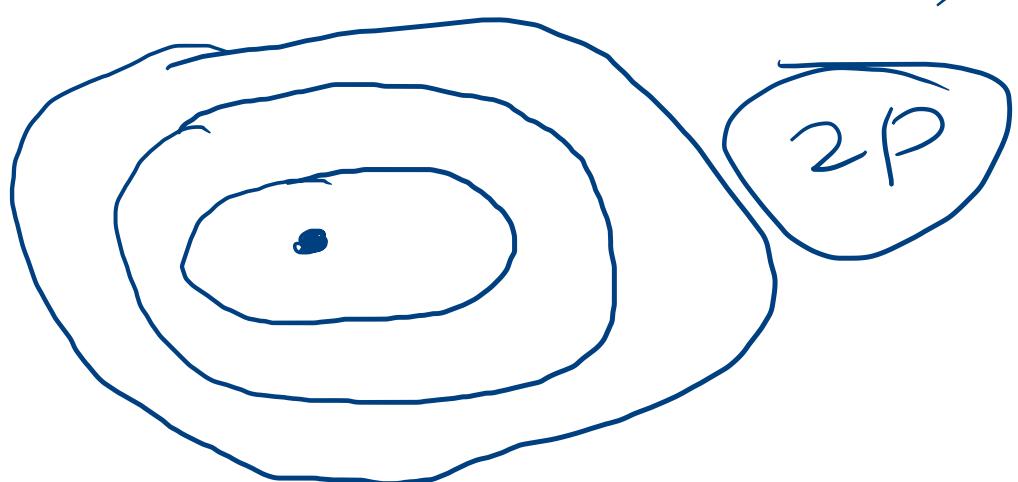


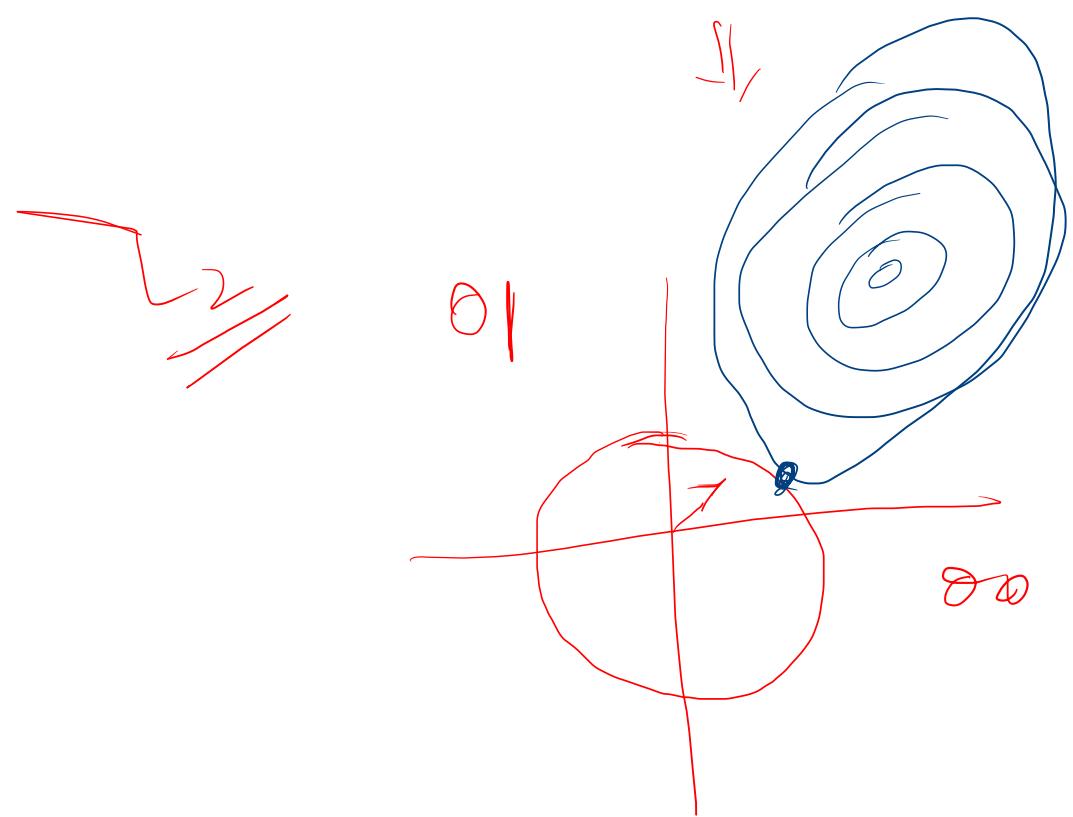
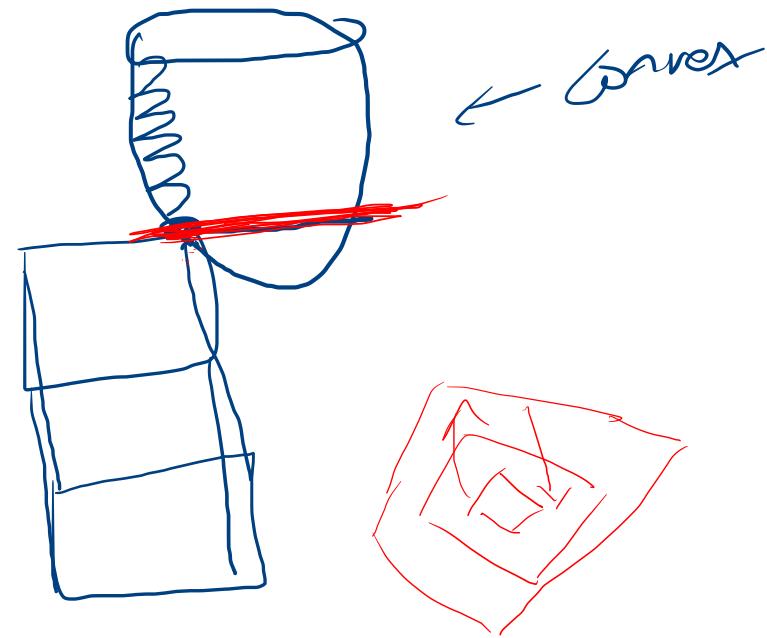
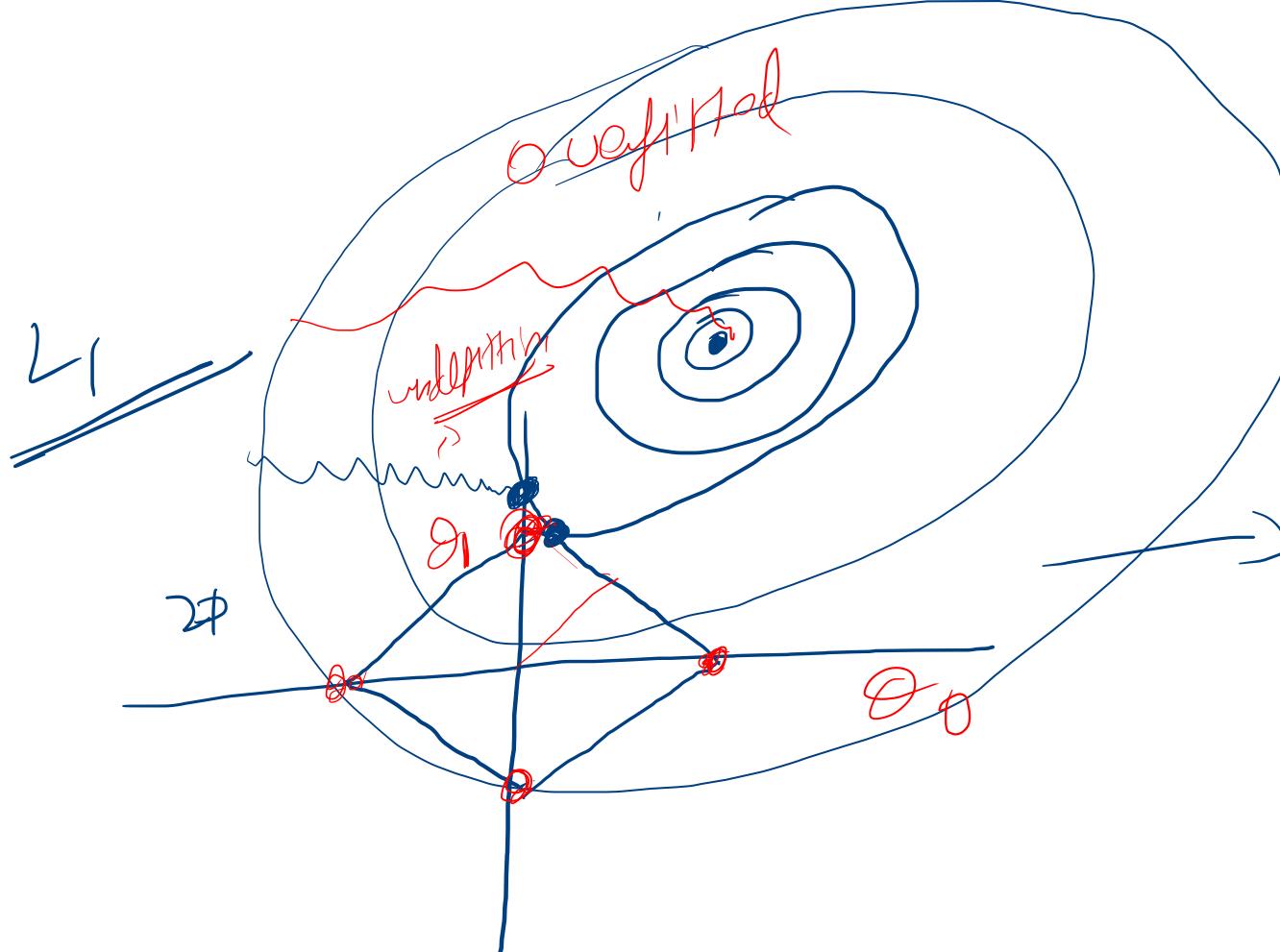
Convex  
3d obj

Convex pbr



2D  
obj

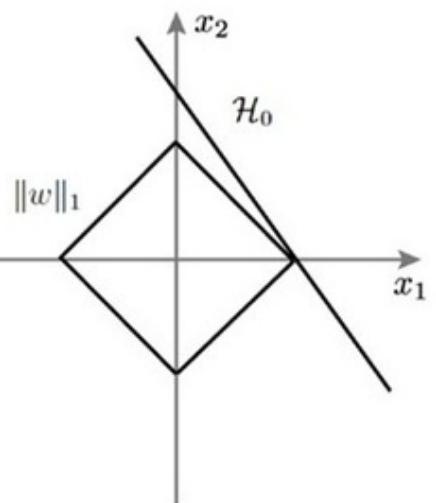




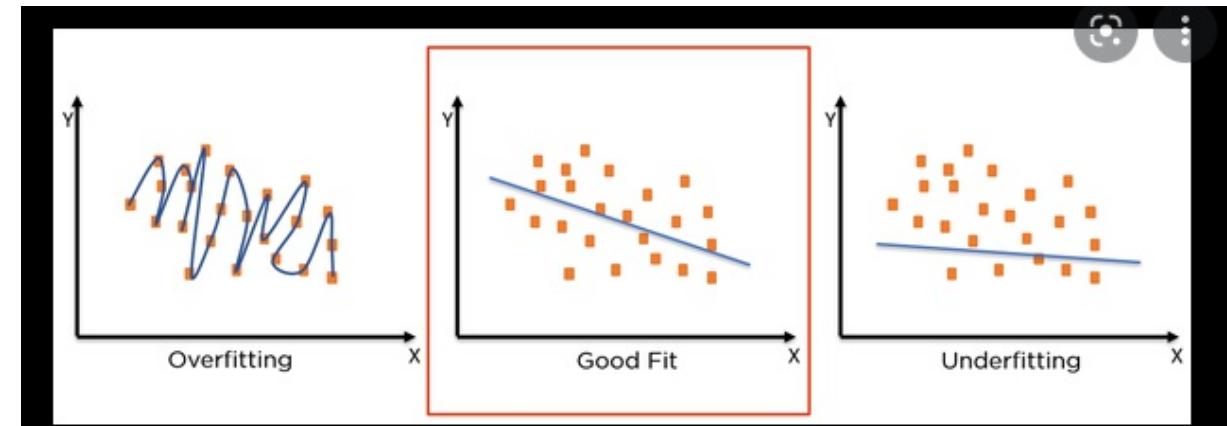
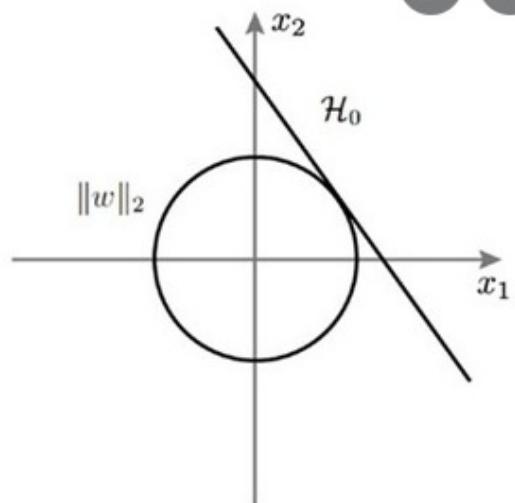
$$x^2 + y^2$$

$$\omega_1^2 + \omega_2^2$$

**A** L1 regularization



**B** L2 regularization



L1 tends to generate sparser solutions than a quadratic regularizer

