1

OPT

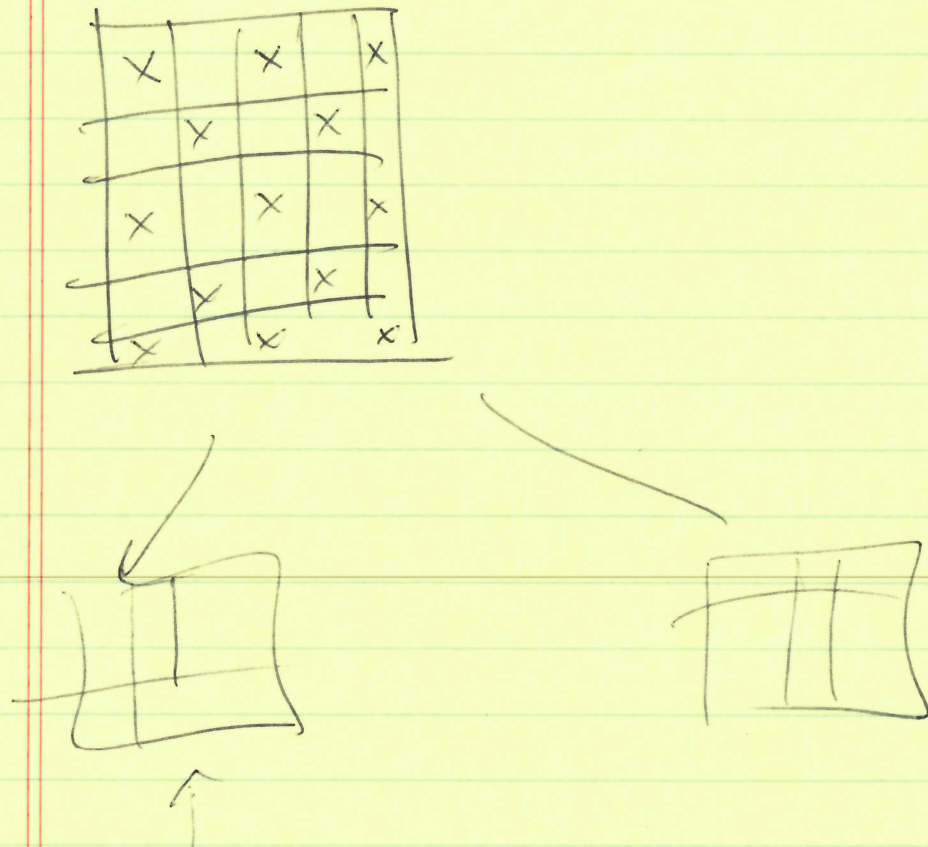
Regression	- least squares	$\min\limits_{\beta} \sum (y_i - x_i^T\beta)^2$
	- least absolute deviations	$\min\limits_{\beta} \sum \lvert y_i - x_i^T\beta \rvert$
Regularized regression	- lasso	$\min\limits_{\beta} \sum (y_i - x_i^T\beta)^2$
Denoising	- TV denoising / fused lasso	s.t. $\sum \lvert\beta_j\rvert \le t$
Classification	- logistic regression	
	- 0-1 loss	
	- hinge loss / SVMs	

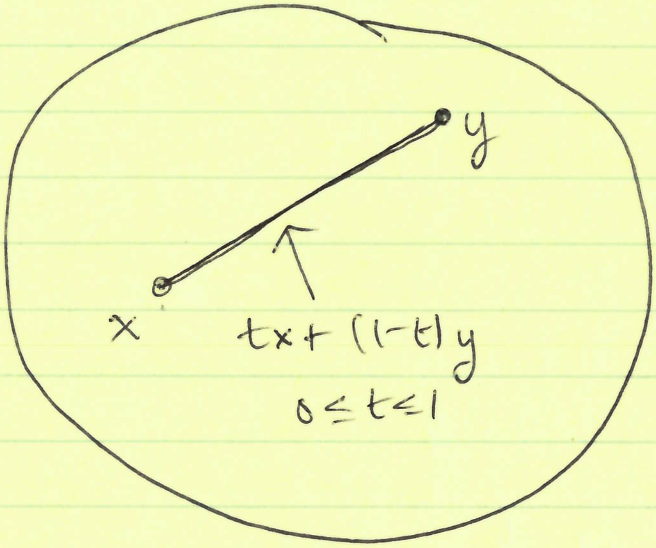
- traveling salesman problem
- planning / discrete optimization

- maximum likelihood estimation

NON OPT

- hypothesis testing / p-values
- boosting
- random forests
- cross-validation / bootstrap





Convex set

$$\mathrm{dom}(\log) = \mathbb{R}_{++} = \{x \in \mathbb{R} : x > 0\}$$

Proof. By contradiction
suppose $\exists\ z \in D$, feasible
such that $f(z) < f(x)$

$$\left(\|z-x\|_2 > \rho \right)$$

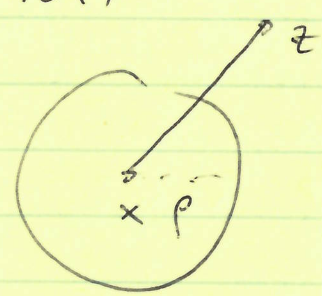
$y = tx + (1-t)z \qquad 0 \le t \le 1.$

- $y \in D$? ✓ D convex
- y feasible ? ✓

$$g_i(tx+(1-t)z) \le t\,g_i(x) + (1-t)\,g_i(z) \le 0$$

$$h_i(tx+(1-t)z) = 0$$

for some t large enough (close to 1) $t<1$
$\|x-y\|_2 \le \rho$



$$\begin{aligned} & f(tx+(1-t)z) \\ & \le t f(x) + (1-t) f(z) \\ & < f(x) \end{aligned}$$

contradiction