

Regression via sketch&solve (subspace embeddings)

ℓ_2 -regression

$$\min \|Ax - b\|^2$$

Sketch $\bar{A} = \begin{bmatrix} A & b \end{bmatrix}$
 $= U \Sigma V^T$

Find S s.t.

$$\forall z \quad \|S U z\|^2 \stackrel{1 \pm \varepsilon}{=} \|U z\|^2$$

$$\Downarrow \quad (\forall x) \quad Ax - b \in \text{col}(U)$$

$$(\forall x) \quad \|Ax - b\|^2 \stackrel{1 \pm \varepsilon}{=} \|S(Ax - b)\|^2$$