

Why ℓ_2 fails?

$$\begin{aligned} \min_{x \in \mathbb{R}^N} \quad & \|x\|_{\ell_2} \\ \text{s. t.} \quad & Ax = y \end{aligned}$$

- $\|x\|_{\ell_2} = r$: sphere of radius r .
- Dual View:
Find the *maximal* sphere touching the line (half-space).



L1 succeeds

$$\begin{aligned} \min & \|x\|_{\ell_1} \\ \text{s .t.} & Ax = y \end{aligned}$$

- $\|x\|_{\ell_1} = c$, is a polyhedron.
- Find the biggest such polyhedron touching $Ax = y$.

