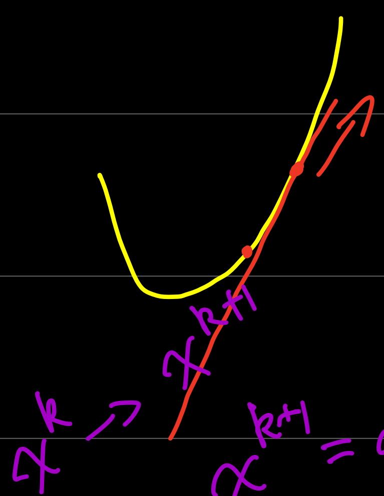
(ALM) 增广拉格朗日乘子法.

$$\min \ f(x)$$
$$\text{s.t.} \ Ax = b.$$

$$\mathcal{L}(x,\lambda) = f(x) + \lambda(Ax-b)$$

$$\mathcal{L}(x,\lambda) = \underbrace{f(x) + \lambda(Ax-b) + \frac{\alpha}{2}\|Ax-b\|_2^2}_{\min}$$



梯度下降 ✓

$$x' = x - \eta \nabla_x \mathcal{L}$$

η 学习率

$$x^{k+1} = \arg\min_x \mathcal{L}(x, \lambda^k)$$

$$\begin{cases} x^{k+1} = x^k - \eta \nabla_x \mathcal{L} \\ \lambda^{k+1} = \lambda^k + \alpha(Ax^{k+1} - b) \end{cases}$$

(ADMM) 交替方向乘子法

$$\min f(x, y) \qquad x$$

$$\text{s.t.} \quad \underline{Ax} + \underline{By} = b$$

$$\mathcal{L}(x, y, \lambda) = f(x, y) + \lambda(Ax + By - b) + \frac{\alpha}{2}\|Ax + By - b\|_2^2$$

update
$$\begin{cases} x^{k+1} = x^k - \eta \nabla_x \mathcal{L}(x^k, y^k, \lambda^k) \\ y^{k+1} = y^k - \eta \nabla_y \mathcal{L}(x^{k+1}, y^k, \lambda^k) \\ \lambda^{k+1} = \lambda^k + \alpha(A\underline{x^{k+1}} + B\underline{y^{k+1}} - b) \end{cases}$$

\$10k ← 市场形势

all in

ALM

$10k ↙ 市场部门推

$5k ↙ ...

$5K

ADNUM