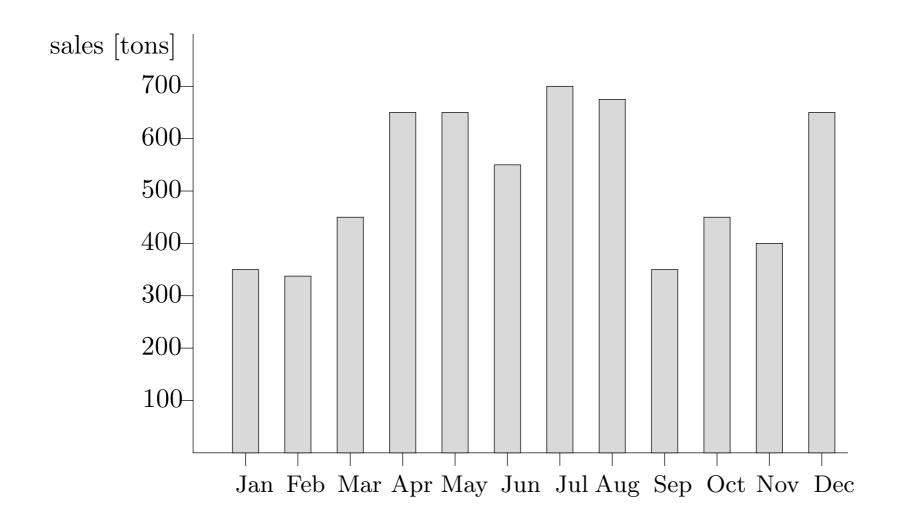
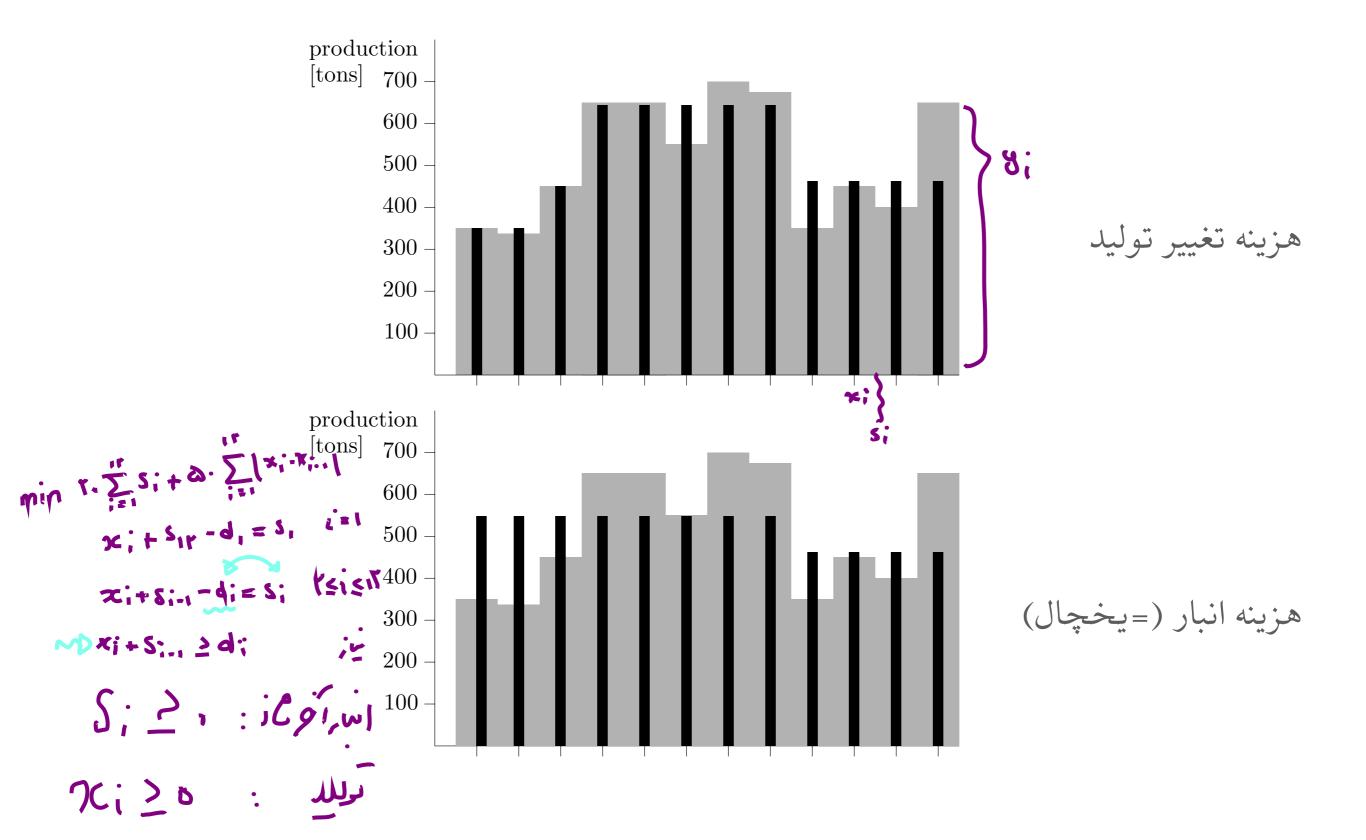


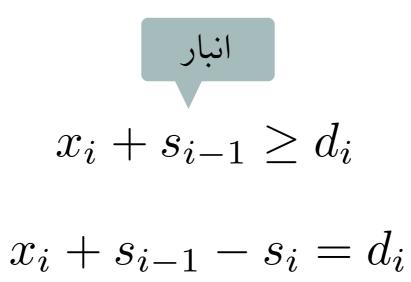
برنامهریزی خطی از آنچه به نظر میرسد قوی تر است!

## فروش بستنى!

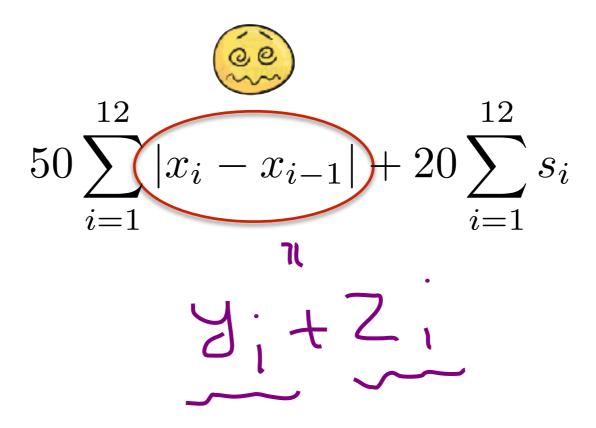




for 
$$i = 1, 2, ..., 12$$



$$50\sum_{i=1}^{12} |x_i - x_{i-1}| + 20\sum_{i=1}^{12} s_i$$



 $egin{aligned} |aligned | |ali$ 

$$\frac{1}{2} \frac{1}{2} \frac{1}$$

Minimize 
$$50 \sum_{i=1}^{12} y_i + 50 \sum_{i=1}^{12} z_i + 20 \sum_{i=1}^{12} s_i$$
  
subject to  $x_i + s_{i-1} - s_i = d_i$  for  $i = 1, 2, ..., 12$   
 $x_i - x_{i-1} = y_i - z_i$  for  $i = 1, 2, ..., 12$   
 $x_0 = 0$   
 $s_0 = 0$   
 $s_1 = 0$   
 $x_i, s_i, y_i, z_i \ge 0$  for  $i = 1, 2, ..., 12$ .

## چرا درست است؟

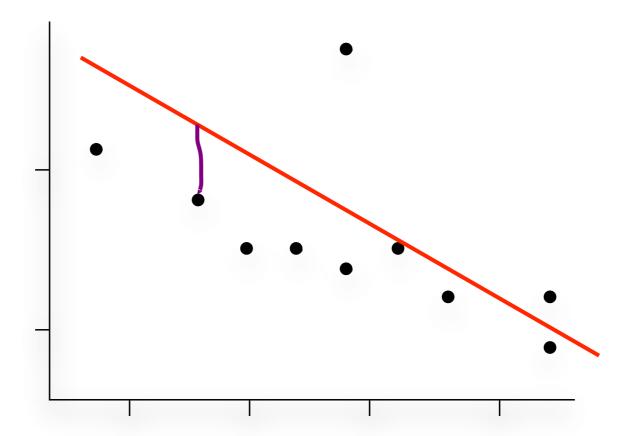
Minimize  $50 \sum_{i=1}^{12} y_i + 50 \sum_{i=1}^{12} z_i + 20 \sum_{i=1}^{12} s_i$ subject to  $x_i + s_{i-1} - s_i = d_i$  for i = 1, 2, ..., 12  $x_i - x_{i-1} = y_i - z_i$  for i = 1, 2, ..., 12  $x_0 = 0$   $s_0 = 0$  $s_{12} = 0$ 

به ازای هر i: yi=0 یا zi=0

 $x_i, s_i, y_i, z_i \geq 0 \text{ for } i = 1, 2, \dots, 12.$ 



برازش خط



$$\sum_{i=1}^{n} (ax_i + b - y_i)^2$$

$$5i = \max\{0, axi+b-3i\}$$
 $ti = \max\{0, -(axi+b-3i)\}$ 

e

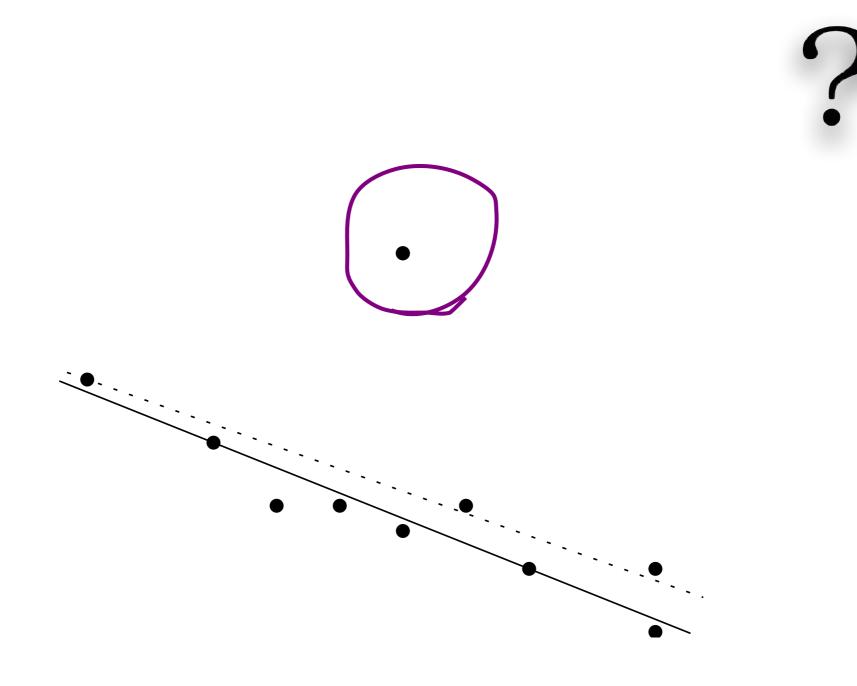
min \( \Si \si ti

 $\sum_{i=1}^{\infty} |ax_i + b - y_i|$ 

dx; +6 -3; =5; - ti

ei > - (axi+b-di) => ei> | 1/1 |

Si, +; 20

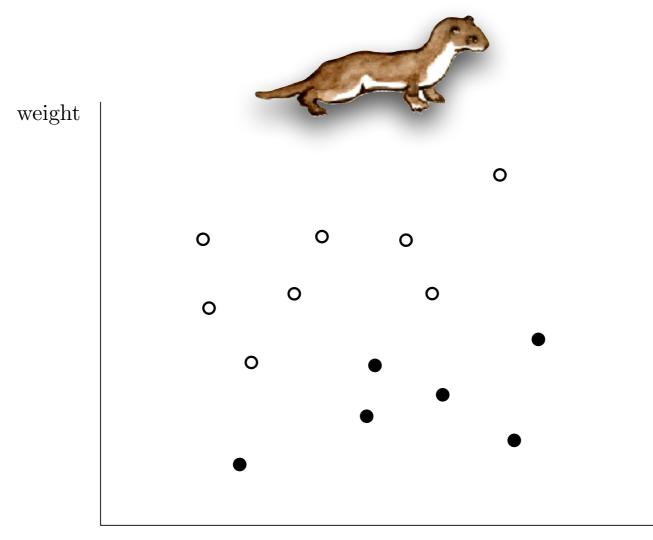


Minimize 
$$e_1 + e_2 + \cdots + e_n$$
  
subject to  $e_i \ge ax_i + b - y_i$  for  $i = 1, 2, \dots, n$   
 $e_i \ge -(ax_i + b - y_i)$  for  $i = 1, 2, \dots, n$ .

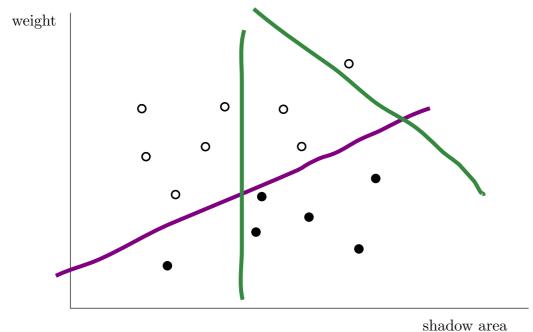




## جداسازی نقاط



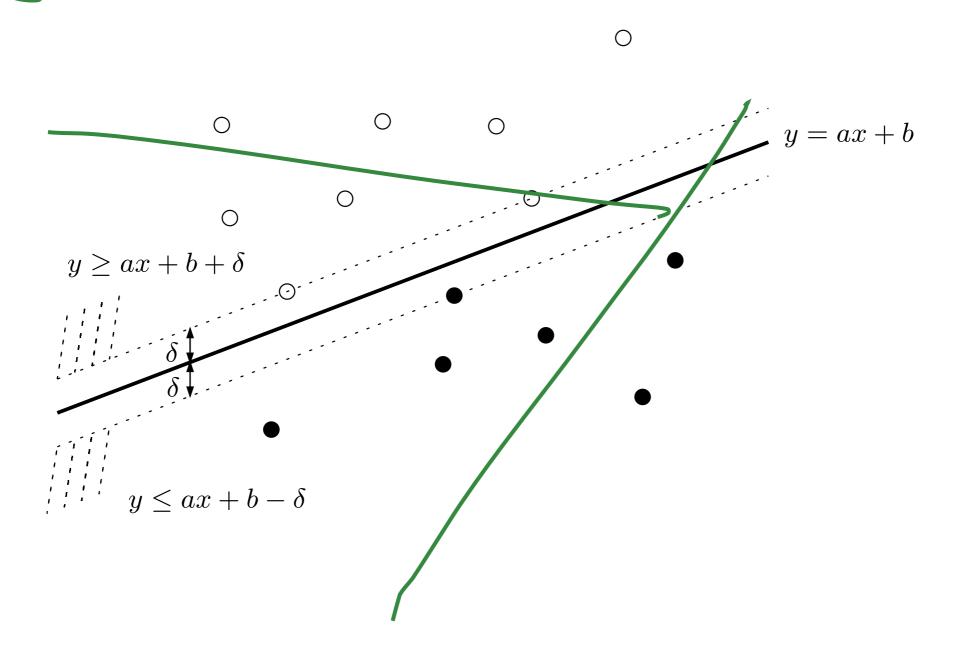
shadow area

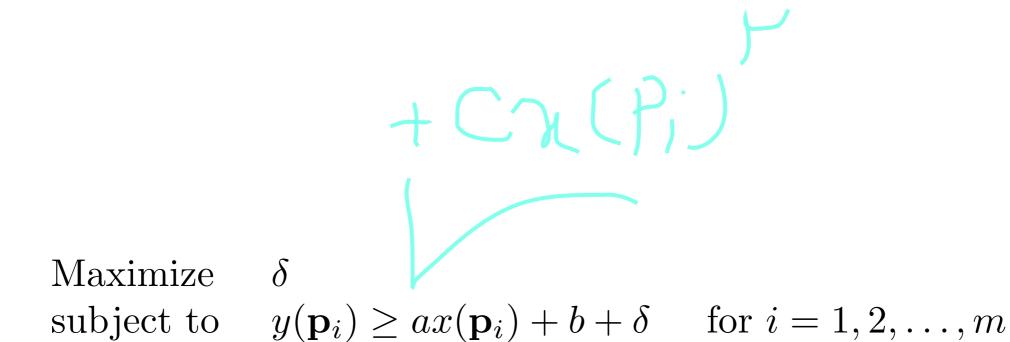


maxe saxithe-dize axithedai

$$y(\mathbf{p}_i) > ax(\mathbf{p}_i) + b$$
 for  $i = 1, 2, ..., m$   
 $y(\mathbf{q}_j) < ax(\mathbf{q}_j) + b$  for  $j = 1, 2, ..., n$ .

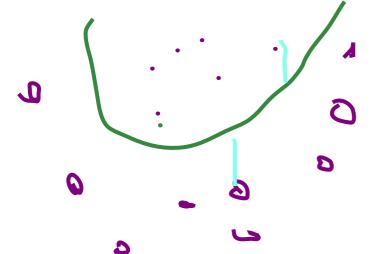
(7





 $y(\mathbf{q}_j) \le ax(\mathbf{q}_j) + b - \delta$  for  $j = 1, 2, \dots, n$ .



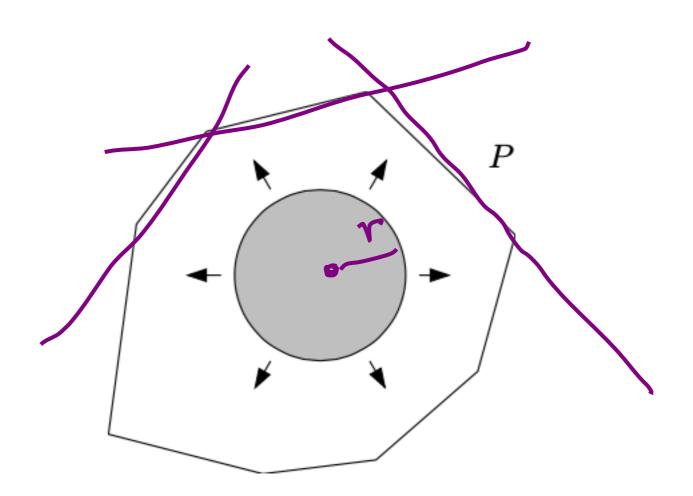


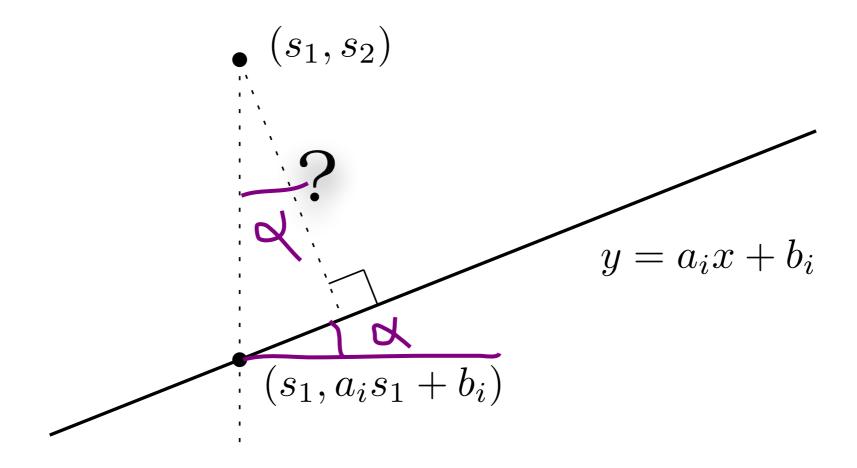
Maximize 
$$\delta$$
  
subject to  $y(\mathbf{p}_i) \ge ax(\mathbf{p}_i)^2 + bx(\mathbf{p}_i) + c + \delta$  for  $i = 1, 2, ..., m$   
 $y(\mathbf{q}_j) \le ax(\mathbf{q}_j)^2 + bx(\mathbf{q}_j) + c - \delta$  for  $j = 1, 2, ..., n$ .



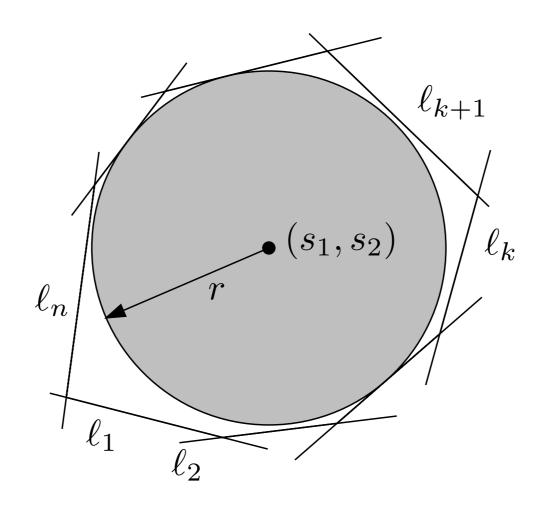
مثال: بزرگترین دیسک در چندضلعی محدب

## بزرگترین و کوچکترین دایره!





$$\frac{s_2 - a_i s_1 - b_i}{\sqrt{a_i^2 + 1}}$$



$$\frac{s_2 - a_i s_1 - b_i}{\sqrt{a_i^2 + 1}} \ge r, \qquad i = 1, 2, \dots, k$$

$$\frac{s_2 - a_i s_1 - b_i}{\sqrt{a_i^2 + 1}} \le -r, \qquad i = k + 1, k + 2, \dots, n$$

Maximize r

subject to 
$$\frac{s_2 - a_i s_1 - b_i}{\sqrt{a_i^2 + 1}} \ge r$$
 for  $i = 1, 2, ..., k$  
$$\frac{s_2 - a_i s_1 - b_i}{\sqrt{a_i^2 + 1}} \le -r$$
 for  $i = k + 1, k + 2, ..., n$