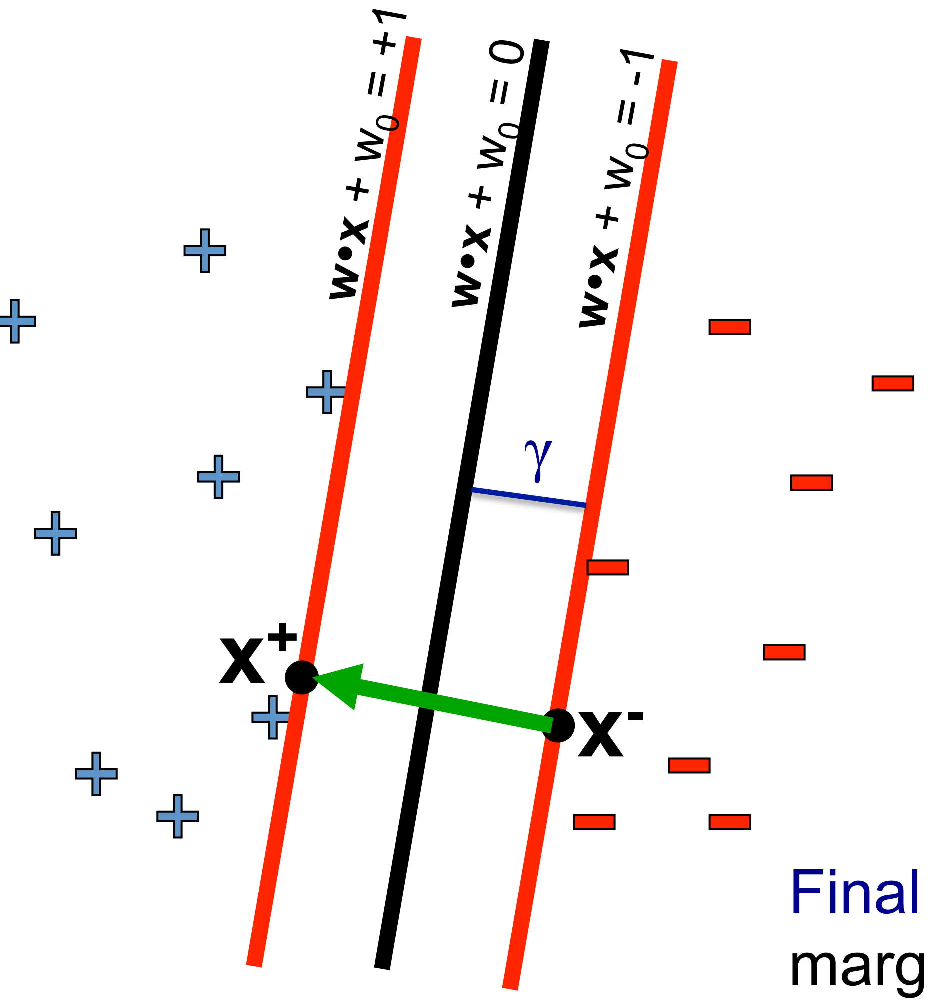
$$x^j = \bar{x}^j + \lambda \frac{w}{\|w\|_2}$$

$$\|w\|_2 = \sqrt{\sum_i w_i^2}$$



Assume: x+ on positive line (y=1 intercept), x- on negative (y=-1)

$$x^+ = x^- + 2\gamma \frac{w}{\|w\|^2}$$

$$w \cdot x^+ + w_0 = 1$$

$$w \cdot (x^- + 2\gamma \frac{w}{\|w\|_2}) + w_0 = 1$$

$$w \cdot x^- + w_0 + 2\gamma \frac{w \cdot w}{\|w\|_2} = 1$$

$$\gamma \frac{w \cdot w}{\|w\|_2} = 1 \qquad w \cdot w = \sum_i w_i^2 = \|w\|_2^2$$

$$\gamma = \frac{\|w\|_2}{w \cdot w} = \frac{1}{\|w\|_2}$$

Final result: can maximize *constrained* margin by minimizing $||w||_2$!!!