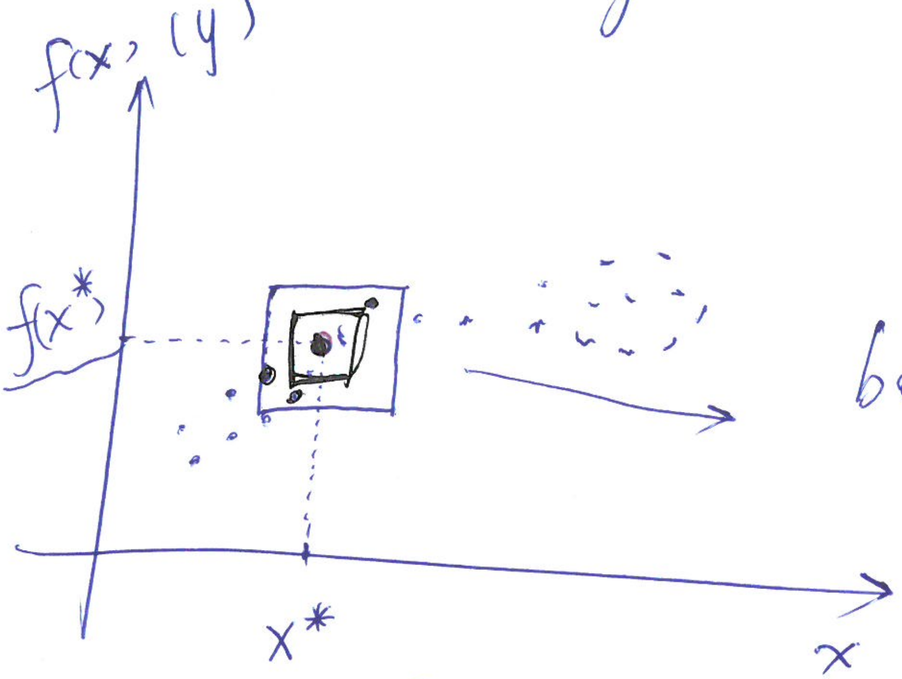
Lecture week 10

Kernel smoothing



box kernel = simple average of y for those points fall in the box.

$w_j = \frac{1}{n}$.

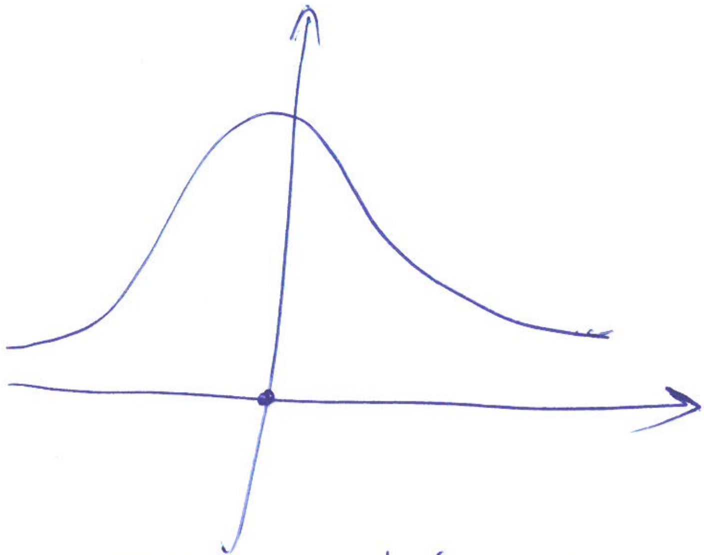
$$f(x^*) = \sum_{j=1}^{n} w_j y_j$$

$$w_j = \frac{K\left(\frac{|x^* - x_j|}{b}\right)}{\sum_{m=1}^{n} K\left(\frac{|x^* - x_m|}{b}\right)}$$

$K(\cdot)$ is the kernel. b is the band with

$K(t) > 0$

normal kernel :



$$k(t) = k\left(\frac{|x^* - x_j|}{b}\right)$$

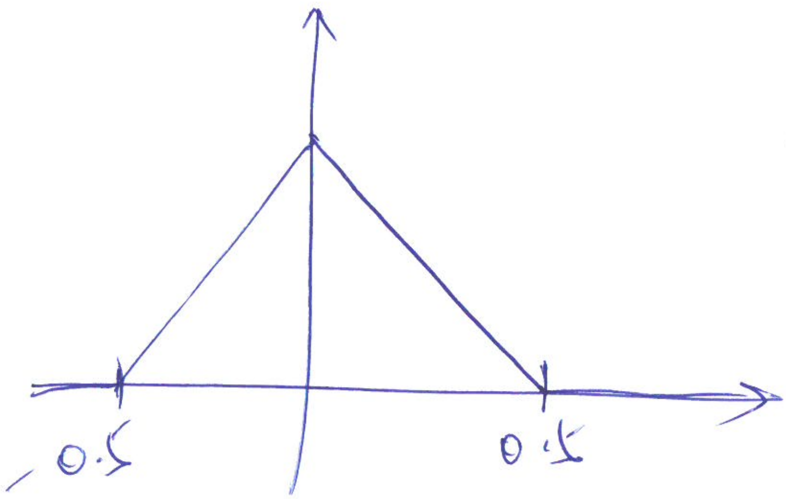
$t \uparrow \quad k(t) \downarrow$

$(b \downarrow, t \uparrow, k(t) \downarrow)$

every data point is considered.

but the point with x far from x^* get less weight.

triangle kernel :



some points get zero weights

How does the band with work

(b)

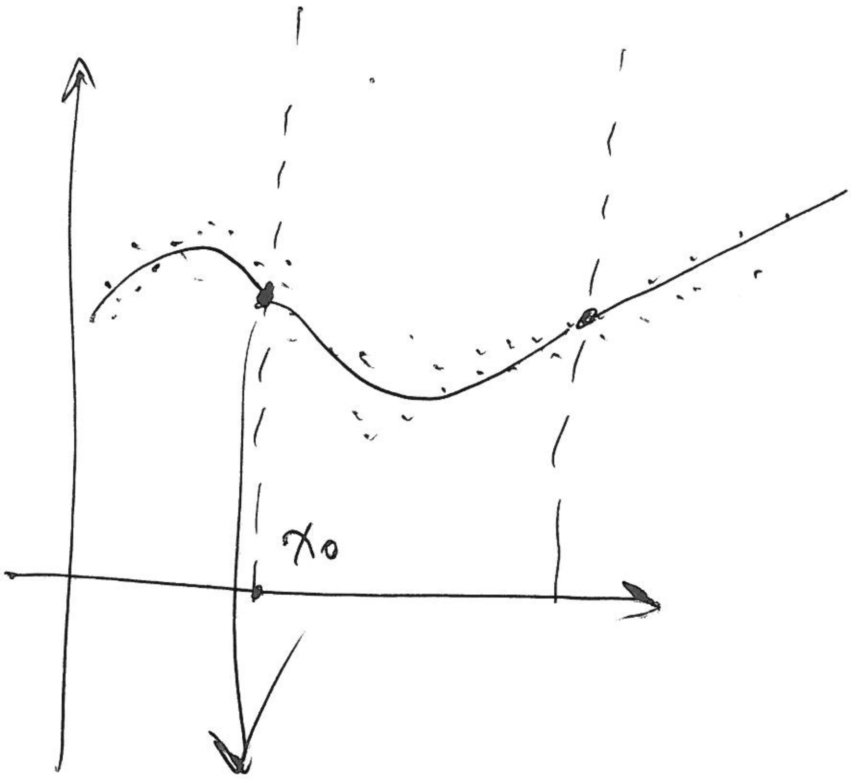
$$K(t) = K\left(\frac{|x^* - x_j|}{b}\right) \quad b \uparrow \quad t \downarrow$$

(e.g. under box kernel,
$b \uparrow$ more points are considered)

$b \uparrow$ smooth $\uparrow$

$|x^* - x_j| \leq 0.5 b \uparrow$

$\Leftrightarrow |t| \leq 0.5$



$S_1(x) = a + bx + cx^2 + dx^3$

Δ

how to find (a, b, c, d)

$S_1(x_0) = S_2(x_0)$

$S_1'(x_0) = S_2'(x_0)$

$S_1''(x_0) = S_2''(x_0)$