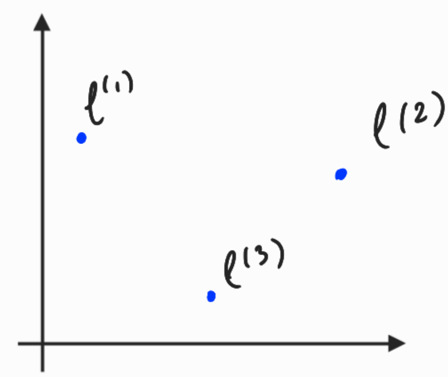
Given x : $f_n = \text{similarity}(x, \ell^{(n)}) = e^{\left(-\frac{\|x-\ell^{(n)}\|^2}{2\sigma^2}\right)}$

$x \nearrow \approx \ell^{(n)}$: $e^{\left(-\frac{0}{2\sigma^2}\right)} \approx 1$

$x \searrow \not\approx \ell^{(n)}$: $e^{\left(-\frac{(\text{large num})^2}{2\sigma^2}\right)} \approx 0$

Change σ^2 $\nearrow$ smaller $\Rightarrow$  $\downarrow$ bias $\uparrow$ variance

Change σ^2 $\searrow$ larger (smoother) $\Rightarrow$  $\uparrow$ bias $\downarrow$ variance



Process:

1^{st} choose landmarks $\ell^{(i)}$;

we put one for each training sample ($\ell^{(i)} = x^{(i)}$)

2^{nd} get $f = \begin{bmatrix} f_0 \\ f_1 \\ \cdots \\ f_n \end{bmatrix}$ where $f_0 = 1$ always

3^{rd} Get θ with $J(\theta)$

4^{th} Use SVM given x

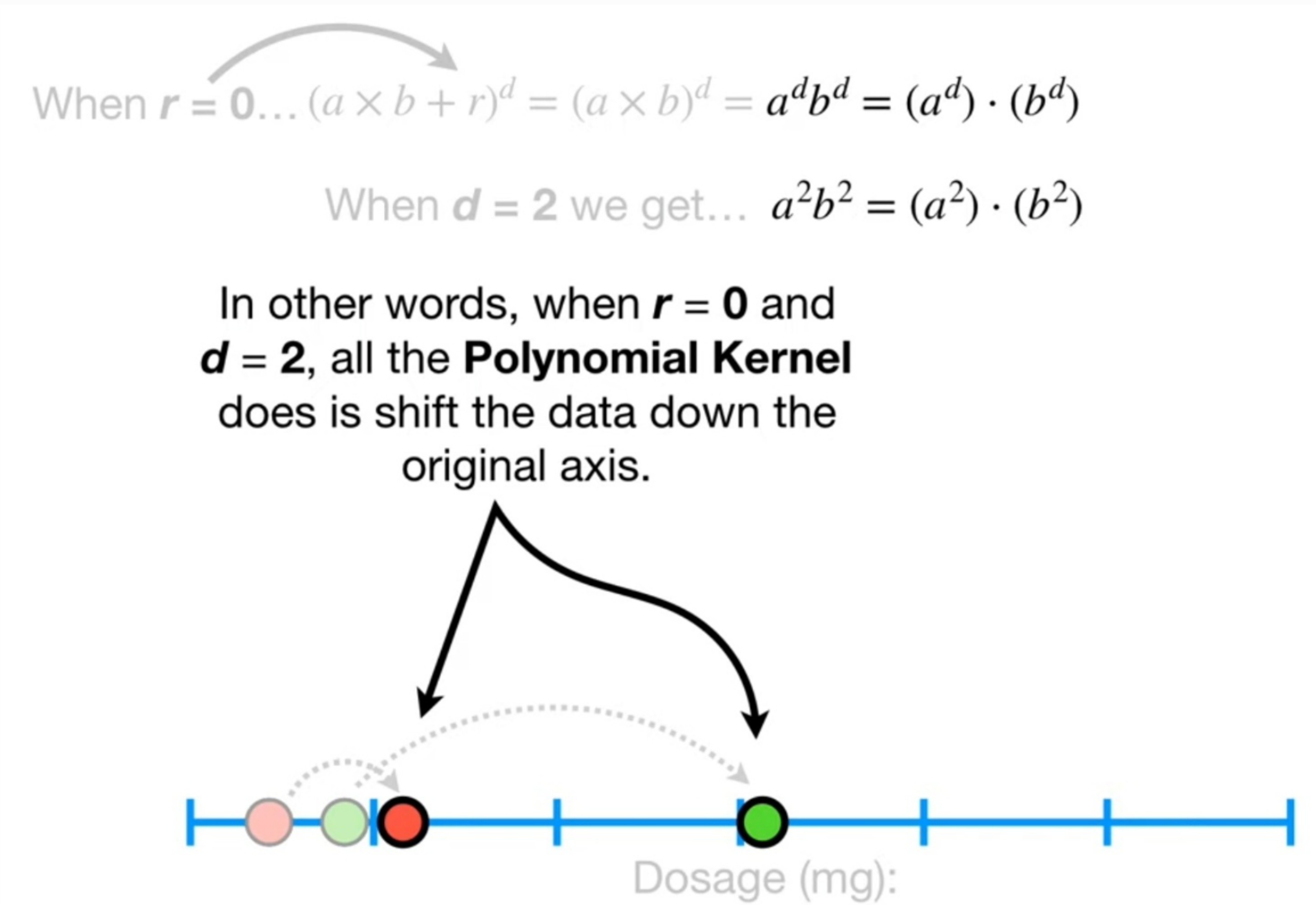
$\hookrightarrow y = 1$ if $\theta^T f \geq 0$, $\forall \theta \in \mathbb{R}^{m+1}$

$\boxed{\text{Polynomial}}$ $(a \cdot b + r)^d$

$a, b \Rightarrow$ 2 data points to calculate relationship for.
$r \Rightarrow$ polynomial's coefficient
$d \Rightarrow$ degree

Then, we compute it for each pair of observations and get the high-dimensional relationship.

So, what it does is to separate samples in a factor of d, and then leverage them by r.



Radial

$$e^{-\underbrace{\gamma}_{\text{determina la influencia de } (a-b)^2 \text{ : iteratively}}\underbrace{(a-b)^2}_{\text{pair of points}}}$$

$$e^{-\gamma(a-b)^2} = e^{-\gamma(a^2+b^2-2ab)} = e^{-\gamma(a^2+b^2)}\boxed{e^{\gamma 2ab}}$$

$$\boxed{f(x) = f(a) + \frac{f'(a)}{1!}(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \cdots + \frac{f^{\infty}(a)}{\infty!}(x-a)^{\infty}}$$

$$e^x = e^a + \frac{e^a}{1!}(x-a) + \frac{e^a}{2!}(x-a)^2 + \frac{e^a}{3!}(x-a)^3 + \cdots + \frac{e^a}{\infty!}(x-a)^{\infty}$$

$$e^x \boxed{= 1 + \frac{1}{1!}x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \cdots + \frac{1}{\infty!}x^{\infty}}$$

$$\boxed{e^{ab} = 1 + \frac{1}{1!}ab + \frac{1}{2!}(ab)^2 + \frac{1}{3!}(ab)^3 + \cdots + \frac{1}{\infty!}(ab)^{\infty}}$$

It is an infinite sum of polynomial Kernels with $r=0$ and $d \in [0, +\infty]$

Example ($\gamma = 1/2$):

...we just multiply both parts of the **Dot Product** by the square root of this term.

$$e^{-\frac{1}{2}(a-b)^2} = \boxed{e^{-\frac{1}{2}(a^2+b^2)}}\left[\left(1, \sqrt{\frac{1}{1!}}a, \sqrt{\frac{1}{2!}}a^2, \ldots, \sqrt{\frac{1}{\infty!}}a^\infty\right) \cdot \left(1, \sqrt{\frac{1}{1!}}b, \sqrt{\frac{1}{2!}}b^2, \ldots, \sqrt{\frac{1}{\infty!}}b^\infty\right)\right]$$

...and, at long last, we see that the **Radial Kernel** is equal to a **Dot Product** that has coordinates for an infinite number of dimensions.