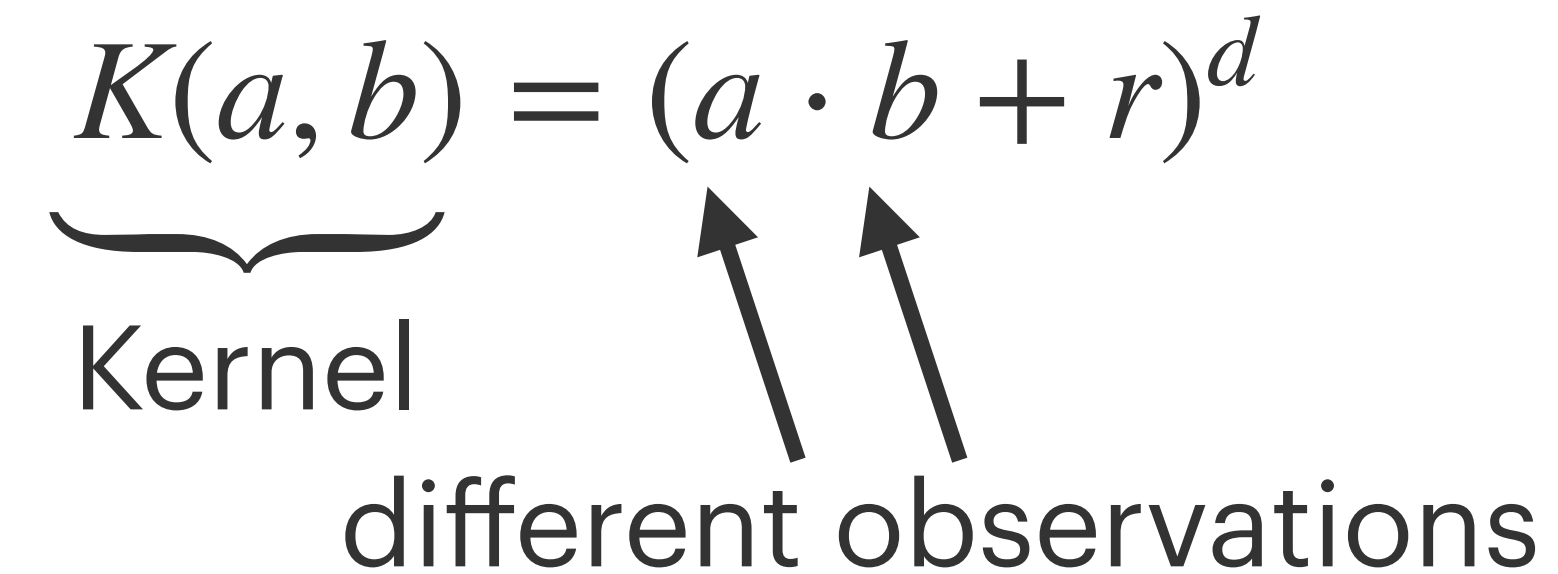


# The Polynomial Kernel

The **Polynomial Kernel** in the previous sleep vs. happiness example

$$\underbrace{K(a, b)}_{\text{Kernel}} = (a \cdot b + r)^d$$

different observations



where  $r$  is the coefficients and  $d$  the degree  
(determined by **cross validation**)

# The Polynomial Kernel

# The **Polynomial Kernel** in the previous sleep vs. happiness example

$$K(a, b) = (a \cdot b + r)^d \quad \text{where } r \text{ is the coefficients and } d \text{ the degree}$$

we set  $r = \frac{1}{2}$  and  $d = 2$ :

$$\begin{aligned}(a \cdot b + \frac{1}{2})^2 &= (a \cdot b + \frac{1}{2})(a \cdot b + \frac{1}{2}) \\ &+ a^2b^2 + \frac{1}{2}ab + \frac{1}{2}ab + \frac{1}{4} \\ &= \boxed{ab + a^2b^2 + \frac{1}{4}}\end{aligned}$$

