The Polynomial Kernel

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

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

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

$$(a \cdot b + \frac{1}{2})^2 = (a \cdot b + \frac{1}{2})(a \cdot b + \frac{1}{2})$$

$$+a^2b^2 + \frac{1}{2}ab + \frac{1}{2}ab + \frac{1}{4}$$

$$= \boxed{ab + a^2b^2 + \frac{1}{4}}$$

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$$= \boxed{ab + a^2b^2 + \frac{1}{4}} = \underbrace{(a, a^2, \frac{1}{2}) \cdot (b, b^2, \frac{1}{2})}_{\textbf{dot product}}$$

gives us the high dimensional coordinates for the data