

# The Radial Kernel (RBF)

## The Radial Kernel

$$K(a, b) = e^{-\gamma(a - b)^2}$$

projects to infinite dimensional space  
works similar to nearest neighbors classifier

we can use the Polynomial Kernel to get the intuition  
behind how Radial Kernel works in infinite dimensions

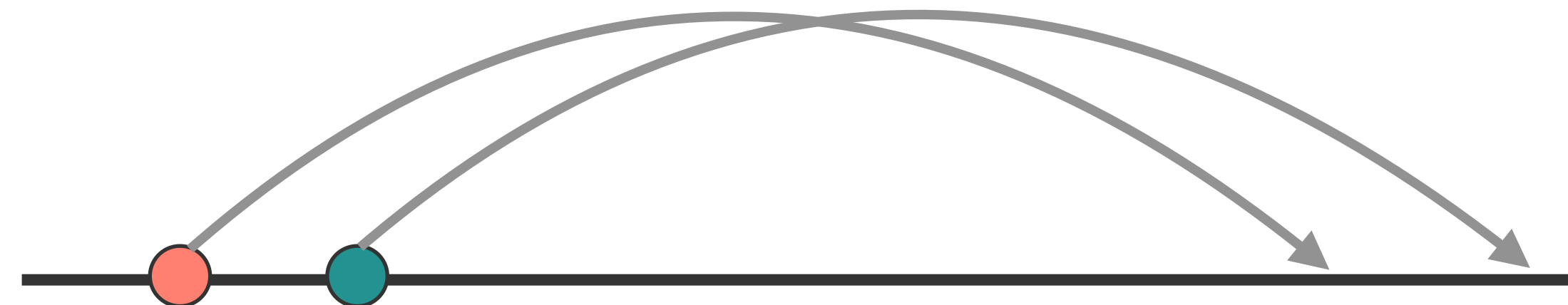
$$K(a, b) = (a \cdot b + r)^d$$

$$\text{set } r = 0 \implies (a \cdot b)^d = a^d \cdot b^d$$

$$\text{set } d = 1 \implies (a) \cdot (b)$$

$$\text{set } d = 2 \implies (a^2) \cdot (b^2)$$

$$\text{set } d = 3 \implies (a^3) \cdot (b^3)$$



we stay in same dimension  
but what if we took these polynomials as a sum?

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$$K(a, b) = (a \cdot b)^d$$

$$ab + a^2b^2 = (a, a^2)(b, b^2)$$

