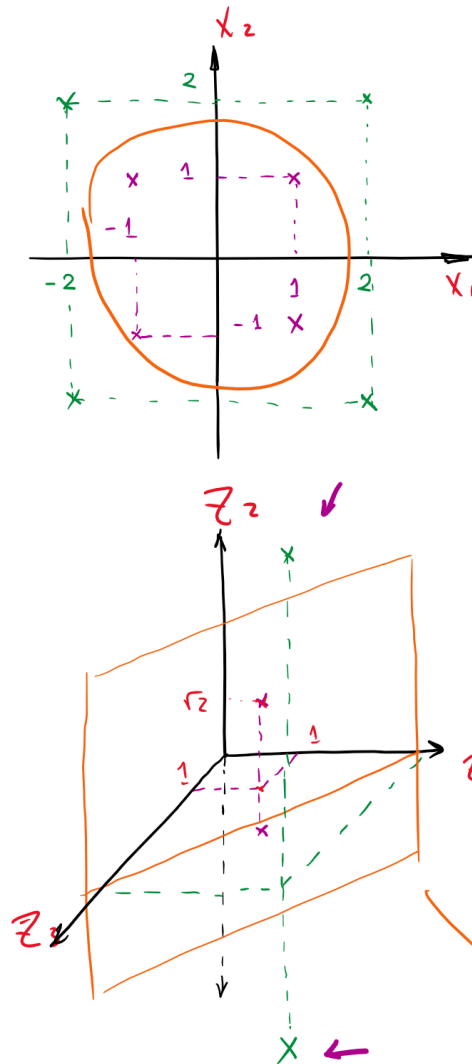


An Example of Polynomial Kernel

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$$\mathbb{R}^2 \rightarrow \mathbb{R}^3$$

$$(x_1, x_2) \rightarrow (z_1, z_2, z_3)$$

$$z_1 = x_1^2$$

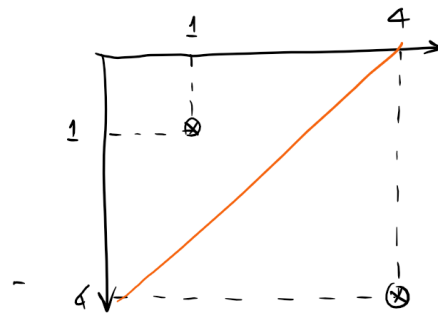
$$z_2 = \sqrt{2} x_1 x_2$$

$$z_3 = x_2^2$$

Polynomial
kernel

$$\left\{ \begin{array}{l} (1, 1) \rightarrow (1, \sqrt{2}, 1) \checkmark \\ (-1, -1) \rightarrow (1, \sqrt{2}, 1) \checkmark \\ (1, -1) \rightarrow (1, -\sqrt{2}, 1) \checkmark \\ (-1, 1) \rightarrow (1, -\sqrt{2}, 1) \checkmark \end{array} \right.$$

$$\left\{ \begin{array}{l} (2, 2) \rightarrow (4, 4\sqrt{2}, 4) \\ (-2, 2) \rightarrow (4, -4\sqrt{2}, 4) \\ (2, -2) \rightarrow (4, -4\sqrt{2}, 4) \\ (-2, -2) \rightarrow (4, 4\sqrt{2}, 4) \end{array} \right.$$



kernel can do the trick to map non-linear separable data into high-dimensional space in which data can be linear separable.