

(a)

obs. 1:

$$\sqrt{(0-0)^2 + (3-0)^2 + (0-0)^2} = 3$$

obs. 2:

$$\sqrt{(2-0)^2 + (0-0)^2 + (0-0)^2} = 2$$

obs. 3:

$$\sqrt{0^2 + 1^2 + 3^2} = \sqrt{10} \approx 3.16$$

obs. 4:

$$\sqrt{0 + 1^2 + 2^2} = \sqrt{5} \approx 2.24$$

obs. 5:

$$\sqrt{(-1)^2 + 0 + 1^2} = \sqrt{2} \approx 1.41$$

obs. 6:

$$\sqrt{1^2 + 1^2 + 1^2} = \sqrt{3} \approx 1.73$$

(b) For the case $k=1$, we will only consider the closest neighbour. From question a we know the closest neighbour is observation 5, with a Euclidean distance of 1.41.

Therefore, prediction is green.

(c) Similar to (b), we look at 3 closest neighbours:

obs. 5 : distance = 1.41 Green

obs. 6 : distance = 1.73 Red

obs. 2 : distance = 2 Red

\Rightarrow Red is more \Rightarrow Prediction is Red.

(d) small.

Reason:

highly non-linear means more complex.

If k is large, the model is less curvy and less flexible, missing out complex patterns.

If k is small, it gets more easily adaptive to local variations in the data, which is what we want.