ML
~~Calculus~~ HW , Anshuman Dikhit

① p1 : (0.3, 0.8)
p2 : (0.7, 0.4)
p3 : (1, 0.1)

a p4 : (0.4, 0.2)

$E(p1, p4) = \sqrt{(0.3-0.4)^2 + (0.8-0.2)^2} = 0.608276$

$E(p2, p4) = \sqrt{(0.7-0.4)^2 + (0.4-0.2)^2} = 0.360555$

$E(p3, p4) = \sqrt{(1.0-0.4)^2 + (0.1-0.2)^2} = 0.608276$

Euclidean Distance: p2, p1, p3

$$\cos(p1, p4) = \frac{(p1, p4)}{\|p1\| \cdot \|p4\|} = 0.733$$

$$\cos(p2, p4) = \frac{(p2, p4)}{\|p2\| \cdot \|p4\|} = 0.998$$

$$\cos(p3, p4) = \frac{(p3, p4)}{\|p3\| \|p4\|} = 0.934$$

Cosine Similarity: p2, p3, p1

① b $x\_new = \frac{1}{1+e^{-x}}$

new P1 $= \left(\frac{1}{1+e^{-0.3}}, \frac{1}{1+e^{-0.8}}\right) = (0.57, 0.68)$

new P2 $= \left(\frac{1}{1+e^{-0.7}}, \frac{1}{1+e^{-0.4}}\right) = (0.6, 0.59)$

new P3 $= \left(\frac{1}{1+e^{-1}}, \frac{1}{1+e^{-0.1}}\right) = (0.7, 0.5)$

new P4 $= \left(\frac{1}{1+e^{-0.4}}, \frac{1}{1+e^{-0.2}}\right) = (0.6, 0.5)$

$d1 = \sqrt{(0.57-0.6)^2 + (0.68-0.5)^2} = 0.182$
$d2 = \sqrt{(0.6-0.6)^2 + (0.59-0.5)^2} = 0.09$
$d3 = \sqrt{(0.7-0.6)^2 + (0.5-0.5)^2} = 0.1$

P2, P3, P1

$\cos(p1, p4) = \frac{(p1, p4)}{\|p1\| \|p4\|} = 0.984$

$\cos(p2, p4) = \frac{(p2, p4)}{\|p2\| \|p4\|} = 0.996$

$\cos(p3, p4) = \frac{(p3, p4)}{\|p3\| \|p4\|} = 0.797$

(2) $x = 0101010011$

$y = 0100101100$

$$SMC = \frac{M_{00} + M_{11}}{M_{00} + M_{01} + M_{10} + M_{11}} = \frac{2+1}{10} = \boxed{0.3}$$

$$Jaccard = \frac{|x \cap y|}{|x \cup y|} = \frac{1}{8} = \boxed{\frac{1}{8}}$$