Naive Bayes

THEORY

1) It is a machine learning algorithm under supervised learning which can be used for classification tasks.
2) Bayes' theorem is given as:

$$\Pr(A|B) = \frac{\Pr(B|A)\Pr(A)}{\Pr(B)} \tag{1}$$

3) Naive Bayes' assumption: The $x_i's$ are conditionally independent given y.
4) Our aim is to maximize the joint likelihood, given as:

$$L(\phi_y, \phi_{j|y=0}, \phi_{j|y=1}) = \prod_{i=1}^{n} p(x^{(i)}, y^{(i)}) \tag{2}$$

5) Hence,

$$p(y=1|x) = \frac{\left(\prod_{j=1}^{d} p(x_j|y=1)\right) p(y=1)}{\left(\prod_{j=1}^{d} p(x_j|y=1)\right) p(y=1) + \left(\prod_{j=1}^{d} p(x_j|y=0)\right) p(y=0)} \tag{3}$$

QUIZ

1) Naive' Bayes classifier is a ML algorithm based on:
   a) Regression tasks
   b) Classification tasks
2) Which is true for Naive' Bayes classifier:
   a) $p(x_i|y) = p(x_i|y, x_j)$
   b) $p(x_i) = p(x_i|x_j)$
3) Prove that $p(x_1, x_2, ..., x_d|y) = \prod_{i=1}^{n} p(x^{(i)}, y^{(i)})$