Instructions - Quiz 2

- Two questions 15 minutes each

- You are given a single sheet of paper
- Write your name and roll number

- Solve Q1 in the first page
- Solve Q2 in the second page [Do not exceed one page for each question]

Question 1: 15 min, 5 marks, Page 1

Univariate Gaussian $p(x;\mu,\sigma) = \frac{1}{\sqrt{2\pi}\sigma} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

Multivariate Gaussian $p(x;\mu,\Sigma) = \frac{1}{(\sqrt{2\pi})^d |\Sigma|^{1/2}} e^{\frac{-(x-\mu)^T \Sigma^{-1} (x-\mu)}{2}}$

$x : 2\times 1$

$\mu : 2\times 1$

$\Sigma : 2\times 2$

When $\Sigma = \begin{bmatrix} 4 & 0 \\ 0 & 1 \end{bmatrix}$ i.e. the two dimensions are uncorrelated with different variance,

show Bayes classifier becomes equivalent to Naive Bayes where $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ is the feature vector

Question 2: 15 min, 5 marks, Page 2

Write the loss function for the k-means algorithm in terms of r_{nk} and $\{\mu_1, \mu_2 \cdots \mu_K\}$

Say $\mu_1, \mu_2 \cdots$ are 2×1

For known r_{nk}, show how $\{\mu_1, \mu_2 \cdots \mu_K\}$ can be optimized and what is the solution

Enough to show for a general μ_j