School of Computer Science
Gujarat University
M.Sc AI & ML) – II & MCA – II (Track - I)
Machine Learning
Assignment – I

Q.1 Differentiate between Supervised Learning and Unsupervised learning. Give three examples of each.

Q.2 What is simple linear regression. What is the concept used in fitting a straight line $y = a_0 + a_1 x$ to the data set, using least squares method.

Q.3 Derive Normal equations for a given data set of points, $\{(x_i; y_i) \mid i = 1, 2, \ldots, m\}$, for simple linear regression.

Q.4 Consider the following data set related to Cow's food intake and milk yield

Food (Kg)	Milk Yield (Liters)
4	3.0
6	5.5
10	6.5
12	9.0

(i) Draw the scatter diagram.
(ii) Derive Normal equations.
(iii) Determine slope and intercept on Y axis using formula.
(iv) Determine slope and intercept using matrix inversion method.
(v) The line fitted should come out to be $y = 0.80 + 0.65x$
(vi) For one kg increase of food, how much milk yield is expected to increase?
(vii) Plot the line manually along with scatter diagram.
(viii) Calculate SSE = sum of Squares of errors $=\sum_{i=1}^{m}(y_i - \hat{y_i})^2$
(ix) Change a_0, keep $a_1 = 0.65$ fixed, accordingly calculate new $\hat{y_i}$ and S.
(x) Plot $(a_0, S(a_0))$ with $S(a_0)$ On Y axis and a_0 on X axis.
(xi) Do the Same by Varying a_1 and keeping a_0 fixed.
(xii) Write a python Program to calculate a_0 and a_1 by formula and Implement the formula and implement it to this example.
(xiii) Write a Python Program to fit straight line using matrix Inversion method [use numpy.linaly.inv ( )] or Scipy [Check determinant $\neq 0$ first] Find the command !!
(xiv) Write a program and draw graph for (ix) and (x) using (matplot : pyplot)
(xv) Write a program to calculate loss function $S(a_0, a_1)$; and plot the surface .

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