Homework 6

Instructions
This homework contains **4** concepts and **7** programming questions. In MS word or a similar text editor, write down the problem number and your answer for each problem. Combine all answers for concept questions in a single PDF file. Export/print the Jupyter notebook as a PDF file including the code you implemented and the outputs of the program. Make sure all plots and outputs are visible in the PDF.

Combine all answers into a single PDF named andrewID_hw6.pdf and submit it to Gradescope before the due date. Refer to the syllabus for late homework policy. Please assign each question a page by using the "Assign Questions and Pages" feature in Gradescope.

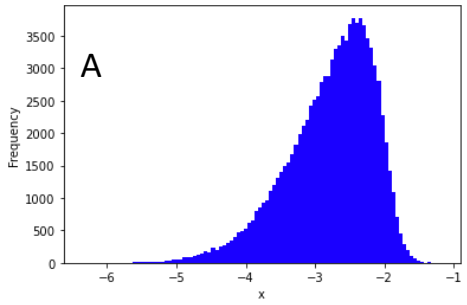
Question	**Points**
Concept 1	3
Concept 2	3
Concept 3	3
Concept 4	3
M6_L1_P1	6
M6_L1_P2	6
M6_L1_P3	9
M6_L2_P1	6
M6_L2_P2	9
M6_HW1	36
M6_HW2	36
Total	**120**
Bonus	6

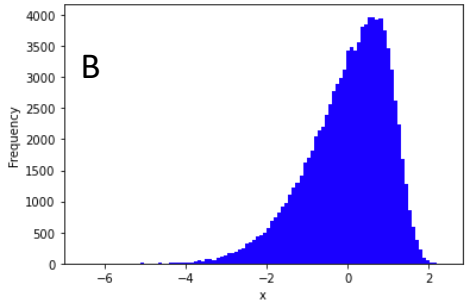
Problem 1

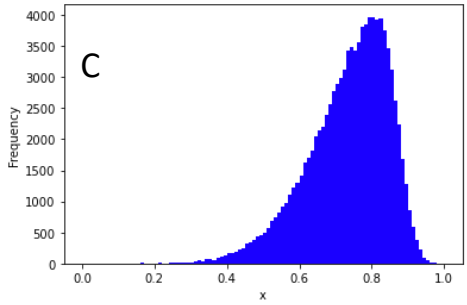
Multiple choice (select one)
Given the original data in A, the data in B and C appears to be:

1. B) Normalized and C) Standardized
2. B) Standardized and C) Normalized
3. B) and C) both unchanged from the original data

2







Problem 2

Multiple Choice (select one)
Which scaling technique would be best to use on the following data:
X = [0.002, 0.01, 100000, 4000, 500, 0.00008, 7]

1. Normalization
2. Standardization
3. Log Transformation

3, as log transformation handles extreme variations the best.

Problem 3

Compute the Pearson's correlation coefficient for the following two features by hand: $x_1 = [8,4,0,-4]$, $x_2 = [-16,-12,-10,2]$

$x_1 = [8, 4, 0, -4] \quad x_2 = [-16, -12, -10, 2]$

$$r = \frac{\sum (x_1 - \bar{x}_1)(x_2 - \bar{x}_2)}{\sqrt{\sum (x_1 - \bar{x}_1)^2 \cdot \sum (x_2 - \bar{x}_2)^2}}$$

$\bar{x}_1 = 2$

$\bar{x}_2 = -9$

$$\sum (x_1 - \bar{x}_1)(x_2 - \bar{x}_2) = \sum [6, 2, -2, -6][-7, -3, -1, 11]$$

$$= -42 - 6 + 2 - 66 = -112$$

$$\sqrt{\sum (x_1 - \bar{x}_1)^2 \sum (x_2 - \bar{x}_2)^2} = \sqrt{(36 + 4 + 4 + 36)(49 + 9 + 1 + 121)}$$

$$= \sqrt{80 \cdot 180} = 120.$$

$$r = \frac{-112}{120} \approx -0.933$$

Problem 4

Multiple choice (select one)
Consider the dataset with features x_1, x_2, x_3, and label y. We have generated the following correlation matrix, and would like to select a feature to remove. We have set the the following threshold $|r| > 0.9$ to drop features. Which of the features should be dropped?

1. x_1
2. x_2
3. x_3

2