

Due: Sunday, Jan 23 before 11:59 pm.

Instructions:

- The entire assignment must be submitted "electronically on Canvas" before the deadline.
- Each assignment should have the following information on the first page: assignment number, student name and z-number, and a shareable link to the final version of your Python code in Colab.

In your Colab notebook, click 'Share' on the upper right corner to get a shareable link, then click 'Get shareable link' and copy the link. NOTE: You will receive 0 credit if you code was not shared properly.

- The Python submission should include the codes and the generated outputs.

To generate the PDF submission file: in Colab, go to 'File'=>'Print', then change the 'Destination' to 'Save as PDF' and save.

- **ONLY one file** must be submitted electronically. Combine the handwritten and Python parts before submission.

You can upload the pictures of your handwritten answers to the drive and then import and show them in a Colab notebook using the matplotlib library.

- Filename for electronic submission: Student_Name_Assignmentxx.pdf or doc.

Problem 1) Simple Calculator: In Python, implement a simple calculator that does the following operations: summation, subtraction, multiplication, division, mod, power, exp, natural log, and abs.

- Follow the instructions below:
 - To work with the calculator, the program asks the user to enter the first number, then the operation, and finally the second number if required.
 - Your code has to recognize the need for the second number and ask for it if required.
 - After performing one operation, the calculator prints the output of the operation.
 - After performing one operation, the calculator must not exit. It has to start again and ready for the next operation.
 - The calculator will be closed if the user writes 'x' as an input.
 - Use functions to perform the operations and the appropriate conditions to prevent common errors such as entering characters as one of the numbers etc.
- Run your code and provide the results for at least one example per operation.

Problem 2) Threshold-based Classifier – We have a two-class classification problem (i.e., C1 and C2). Each data sample is represented by two attributes (x, y). The three data samples in class C1

are $\{(1, 1), (3, 2), (2, 3)\}$ and $\{(1, 2), (2, 2), (2, 1)\}$ in class C2. Perform the followings in Python:

- a) Plot the data samples. The data points in classes C1 and C2 must be in two different colors and shapes. Label the axes and add legends as appropriate.
- b) The code asks the user to enter two thresholds th_x and th_y .
- c) Your code calculates and prints the classification accuracy based on the user-entered thresholds. To do so, assume that for any data point (x, y) with $x > th_x$ and $y > th_y$, the data sample belongs to class C1, and C2 if otherwise. Using this rule and the user-entered thresholds, the code calculates the classification accuracy for the six data samples. The classification accuracy is defined as the number of correctly classified data points over the total number of data points (6 in here).
- d) Use a for loop to repeat part c for a total of three times and enter different sets of thresholds each time.
- e) Based on your observation from the results above, report a suitable set of thresholds that will give the highest possible accuracy. Report your suggested thresholds and the corresponding classification accuracy.