HW2 Matplotlib and NumPy (70 points)

Electronic submission due 11:59pm, Thurs 2/24

To complete this homework, you need to download the data file named gradebook.txt, which contain the grades of 100 students in a class. The data file contains 100 rows, each of which represents a student, and 20 columns: the first 10 columns are quizzes, the next 7 columns are homeworks, and the last three columns are exams.

Complete the python script to analyze the data and produce several statistics and three figures (see example figures on the next page).

For your information, I have used the Pandas package (to be covered later) to load the data file into a NumPy array object named *grades*.

Submission: submit a .py **OR** .ipynb file (**5 extra points**) through blackboard. Do **NOT** submit the data file.

1. (5 points) Find out how many values in the array is negative or NaN, report the counts, and replace NaNs or negative values with 0.
2. (10 points) Generate a bar chart for the max of each column (20 bars).
3. (10 points) Generate a bar chart for the mean of each HW (7 bars).
4. (10 points) Scatter plot the average of the two midterm exams exam against the final exam.
5. (10 points). Sort the final exam score (last column) to find the row index with the top 5 highest scores and report. Also report their grades for the three exams.
6. (15 points) Compute a final weighted average score of each student: divide each column by the max of that column and then multiple by 100; and then compute a weighted average where each quiz counts 2%, each hw counts 5%, exam 1 and 2 each of which counts 10%, and the final exam counts 25%. Round the final score to the nearest integer. Report the following statistics for the final scores: max, min, median, mean, standard deviation.
7. (10 points) Count the number students whose final score is in the following range: < 60; >=60 and < 70, >=70 and < 80, >=80 and < 90, and >= 90, and plot the counts as a bar chart.

Fig 1

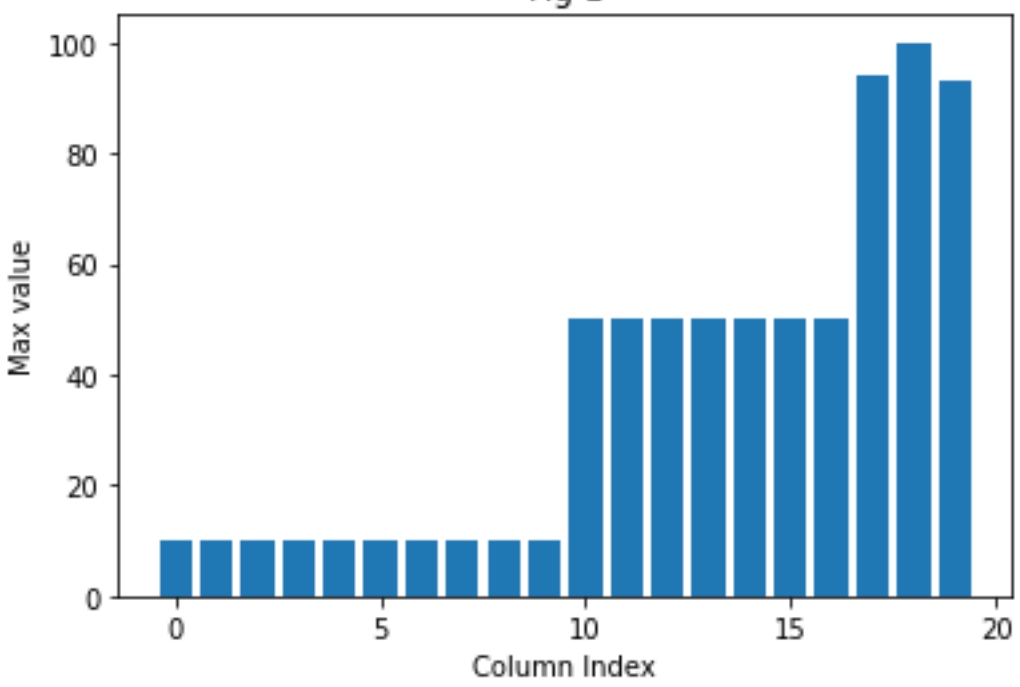

Max value
Column Index
0
20
40
60
80
100
0
5
10
15
20

Fig 2

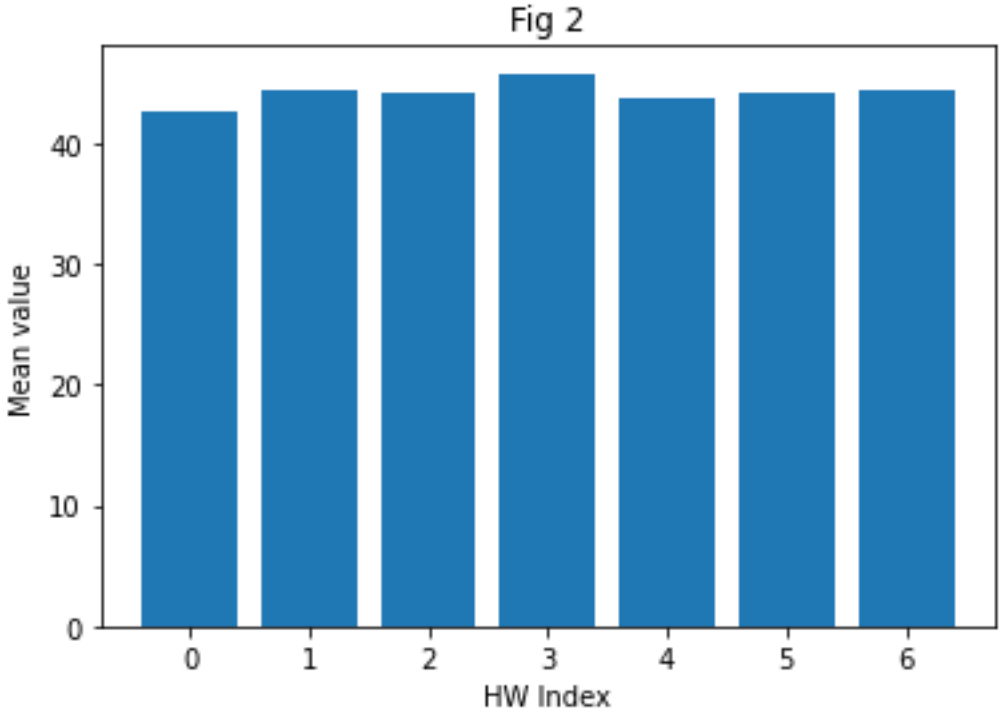

Mean value
HW Index
0
10
20
30
40
0
1
2
3
4
5
6

Fig 3

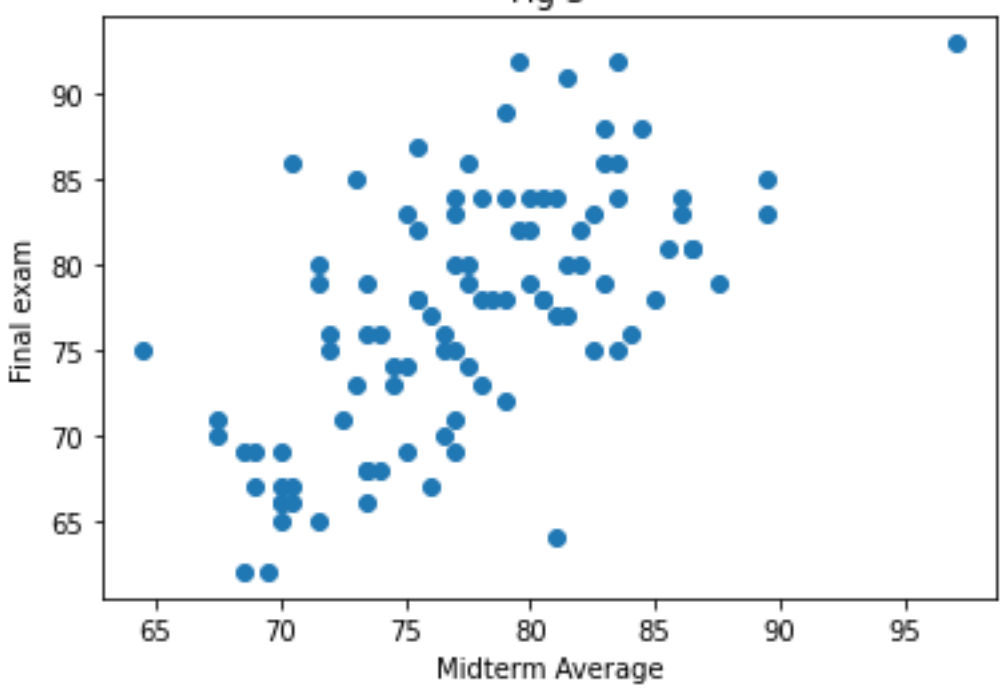
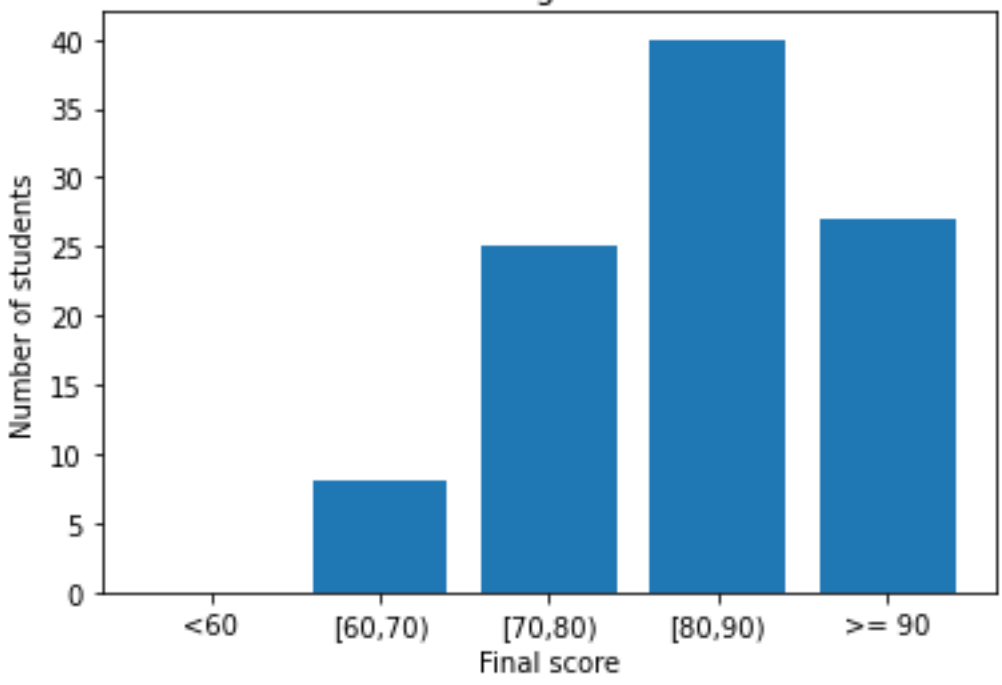

Final exam
90
85
80
75
70
65
65
70
75
80
85
90
95
Midterm Average

Fig 4


Number of students
40
35
30
25
20
15
10
5
0
<60
[60,70)
[70,80)
[80,90)
>= 90
Final score