

Technical Homework 4

PHY410: Do problems 1 and 2
PHY 505: Do all three problems.

Accept the assignment from github classroom: <https://classroom.github.com/a/lsXgyeh2>. You will then get a link to your own github area. You should submit your code through github classroom. Submit your writeup, and a link to your github classroom area where your code is, on UBLearn. Be sure to have a github account and link it to your assignment.

My example is (and yours will be different):

```
git clone https://github.com/ubsuny/technical-assignment-4-rappoccio
cd technical-assignment-4-rappoccio
mkdir Assignment4
cd Assignment4
git add *.cpp *.h *.ipynb
git commit -m"I hope I passed"
git push origin master
```

Please name your files after the problem number like "Problem1.cpp", "Problem2.py", "Problem3.ipynb" etc.

Problem 1:

"Student Records" indicate student performance in their courses.

These records are input as a text file with the following values separated by commas:

- Name of course
- Last name
- First name
- List of scores for the course and their weights.

Each course will have a different number of scores and weights.

Example:

```
Physics,Tip,Q,87.3,95.0
Literature,Dawg,Phife,95.0,85.0,98.0
Physics,Muhammad,Ali Shaheed,97.0,80.0
History,White,Jarobi,85.0,84.0
```

There are three courses: Physics, History, and Literature.

- Physics course should have two scores: homework (80% of grade) and lab (20% of grade).
- History course should have two scores: exam1 and exam2. The higher grade is weighted 60% and the lower grade is weighted 40%.
- Literature course should have three scores: analytic (40%), creative (40%), and commentary (20%).

The assignment is to:

- Input the values in a csv record that is specified on the command line.
- Print the list of students in each course separately, sort them by their overall average, print their names and ALL of their scores. So like (these are not the real answers but only the format):
Tip, Q: 100,99,98, avg=99
Muhammed, Ali Shaheed: 98,97,96, avg=97
- Print the total averages for each course.

Problem 2:

Repeat problem 1, but in python.

Problem 3 (PHY505 only):

The Diffusion equation is given by:

$$\frac{\partial u}{\partial t} = \nu \frac{\partial^2 u}{\partial x^2} + \nu \frac{\partial^2 u}{\partial y^2}$$

In discretized form, the $n + 1$ st time step is related to the n th time step by:

$$u_{i,j}^{n+1} = u_{i,j}^n + \frac{\nu \Delta t}{\Delta x^2} (u_{i+1,j}^n - 2u_{i,j}^n + u_{i-1,j}^n) + \frac{\nu \Delta t}{\Delta y^2} (u_{i,j+1}^n - 2u_{i,j}^n + u_{i,j-1}^n)$$

If we assume $\Delta t = 1, \Delta x = 1, \Delta y = 1, \nu = 1$, this becomes

$$u_{i,j}^{n+1} = u_{i,j}^n + (u_{i+1,j}^n + u_{i,j+1}^n - 4u_{i,j}^n + u_{i-1,j}^n + u_{i,j-1}^n)$$

Starting with the jupyter notebook "Problem3.ipynb", implement one step of the diffusion equation WITHOUT using for loops!