Instruction: Completed homework should be typed (e.g., using LaTeX or word document) or hand-written clearly and scanned and uploaded into Moodle. You can discuss about the problems, but no collaboration is permitted to solve the problems.

1. The IWPC Warfarin dosage equation is provided below:

$$Dosage \left(\frac{mg}{week}\right)$$
$$= [5.6044 - 0.2614 \times \text{age (in decades)} + 0.0087 \times \text{height (cm)}$$
$$+ 0.0128 \times \text{weight (kg)} - 0.8677 \times \text{VKORC1 A/G} - 1.6974 \times \text{VKORC1 A/A}$$
$$- 0.4854 \times \text{VKORC1 genotype unknown} - 0.5211 \times \text{CYP2C9} * 1/* 2$$
$$- 0.9357 \times \text{CYP2C9} * 1/* 3 - 1.0616 \times \text{CYP2C9} * 2/* 2 - 1.9206 \times \text{CYP2C9} * 2/* 3$$
$$- 2.3312 \times \text{CYP2C9} * 3/* 3 - 0.2188 \times \text{CYP2C9 genotype unknown}$$
$$- 0.1092 \times \text{Asian race} - 0.2760 \times \text{Black or African-American}$$
$$- 0.1032 \times \text{missing or mixed race} + 1.1816 \times \text{enzyme} - \text{inducer status}$$
$$- 0.5503 \times \text{amiodarone status}]^2$$

- Age in decades should be entered as 1 for 10–19 years, 2 for 20–29 years, 3 for 30–39 years
- Enzyme-inducer status = 1 if patient taking carbamazepine, phenytoin, rifampin, or rifampicin, otherwise 0
- For VKORC1, CYP2C9, race and amiodarone status enter 1 if present, otherwise 0. For example, if the patient is VKORC1 A/G then only the coefficient for VKORC1 A/G is 1 and the coefficient for all other VKORC1 genotype is 0. Similarly, for any **nonmatching coefficient assign such coefficient to 0** (e.g., if is the race of a person is Caucasian then you simply assign 'Asian race' =0 and 'Black or African–American' =0). For any missing value simply assume its contribution is zero to the dosage (e.g., VKORC1 G/G contributes nothing to the dosage).

Variable	Units or Allowed Values
Age	Years
Height	Centimeters (cm)
Weight	Kilograms (kg)
VKORC1 genotype	A/A A/G G/G U ((for Unknown)
CYP2C9 genotype	*1/*1 *1/*2 *1/*3 *2/*2 *2/*3 *3/*3 U (for Unknown)
Race	A (for Asian) B (for Black or African American) C (for Caucasian or White) U (for Unknown or Mixed Race)
Taking Enzyme Inducer	Y (for Yes) N (for No or not known)
Taking Amiodarone	Y (for Yes) N (for No or not known)

Assume Bob is your neighbor who is 56-year-old Caucasian male. Let us you are gym buddies and hence know his height (5 feet 10 inch) and weight (around 72 kg). Also let us assume that Bob has bipolar disorder (i.e., takes carbamazepine) and heart rhythm problem (i.e., takes amiodarone). One day you saw Bob's prescription for Warfarin dose to be around 21mg/week then what is his VKORC1 and CYP2C9 genotypes? Write a code to compute the genotype using all the auxiliary information you have. [points 10+10] (code+answer)

2. You are given a skeleton for testing Federated Learning based approach. Create 10 worker nodes. Assign them ids like "node1", "node2" etc. Then distribute the data across the nodes (the *syft* package has a function to do this easily; take a close look at the code for **TODOs inside the code**). Next, randomly select **X** nodes to participate in the learning process and observe the test accuracy after **N** epochs. **Change the seed for random number generation to your student ID number on line 17**.
   - Vary the value of **X** as 3, 5, 7, 10 (setting N to 3) and report the test accuracy at the end of the last iteration. [points 15]
   - Vary the value of **N** from default 3 to 5 (setting X to 5) and report the test accuracy at the end of the last iteration. [points 15]

   Output should look like the following tables:

X	Accuracy (when N=3)
3	
5	
7	
10	

N	Accuracy (when X=5)
3	
5	
10	

   Also comment on what you find after varying X and N. [points 10]
   Submit your code and README if there are any special instructions.

3. In class we talked about Westin's privacy index regarding people's privacy concerns in our digital world. In this task you will revisit this question and design a quick survey to measure people's privacy concerns regarding **any topic of your choice**. Try to extend Westin's basic survey and add your own questions. Please keep the survey short so that it doesn't require more than 3-5 minutes and try to recruit at least 5-10 participants.

   You should turn in the following things:
   a) Clear statement of your research question and/or hypothesis in a single sentence [points 5]
   b) One paragraph summarizing major decisions you made and things you kept in mind when designing your survey [points 5]
   c) Text you used to recruit participants [points 5]
   d) How you recruited participant and screening criteria (if any) [points 5]
   e) How you implemented your survey (Qualtrics or Google form, **provide link**) [points 5]
   f) The survey itself [points 5]
   g) The findings from the participants (include stats and/or plots) [points 10]

   Because this is for a class assignment and is not considered "research," you do not need to get IRB approval or include the NCSU consent form. You should still treat your participants ethically.

Submission:
You have to submit the following files:
1. Merge all the written parts into a single pdf file <your unity id>_HW4.pdf (make sure you submit PDF file only)
2. Rename the program files (.c/.cpp/.java/.py) you used as <your unity id>_QX.extension. (for question no. X) [don't submit ipython script]. **Also attach any input files used by the code and a README file for executing your code.**

Zip all files into <your unity id>_HW4.zip and submit the zip file on Moodle.