Pre-test
Due Sept 2, 2016 11:59 PM

Name : Student Name

Instructions

This take-home pre-test is intended to help the professor learn more about you and your prior knowledge and skills that are beneficial in this course. You are requested to answer all questions under the section "Personal Information". For the other section, "Background Questions", only attempt to answer the questions for which you believe that you know how to solve for an answer. Do not worry about using online or other resources to try to teach yourself how to answer the questions, if you do not already know. Instead, if you do not know how to solve for an answer, simply provide a response of "I don't know". *You are* **not** *assumed to have known how to answer these questions before this class.* **Please do not be discouraged if you do not know how to answer some or all of the questions.** *You* **will not be graded based on the accuracy of your answers** *to the "Background Questions", and your responses will aid the professor in knowing what background material to cover early in the semester so that the class can properly learn about machine learning and data mining.*

Please enter your name in the space provided above. You are encouraged to prepare your solutions in LaTeX, but you are only required to turn in your solution as a PDF (meaning you can also use Microsoft Word or another text editor to type your answers). For this pre-test, please use the CSCI 374 site on Blackboard to hand in your final PDF. Please email the professor (or use Piazza) early if you encounter any difficulties. The pre-test is due at 11:59 PM on Friday, September 2. Late submissions will be accepted but will be penalized as described in the course syllabus (available online at http://www.cs.oberlin.edu/~aeck/CSCI374/).

Since this pre-test is intended to represent you, please do not work with your peers (or discuss answers) on this pre-test.

Personal Information

1. What name would you prefer to be called?

2. What are your preferred pronouns?

3. What is (are) your major(s)/minor(s), and what are your favorite academic areas of interest?

4. What computer science and math courses have you taken prior to this semester? Which courses in these areas are you currently taking?

5. In which programming languages are you experienced? Which language(s) do you prefer to use when developing programs?

6. What are your goals for this course? What are you hoping to learn or get out of the course?

7. What are your career goals or aspirations after Oberlin College?

8. What are your favorite hobbies?

9. Is there anything you want the professor to know about you as we start this course together?

10. Does at least one of the office hour times listed on the course syllabus work with your schedule? If not, please suggest alternative times.

BACKGROUND QUESTIONS

1. Consider the following logic questions.

   (a) The following logical proposition describes the characteristics of a ball. What does this proposition represent? That is, how would we say its meaning in conversational English?

   $$shape = \text{round} \wedge color = \text{orange}$$

   (b) The following logical proposition describes the conditions under which the lawn might be wet. What does this proposition represent? That is, how would we say its meaning in conversational English?

   $$weather = \text{rainy} \vee sprinkler = \text{on}$$

   (c) Assume that $X = \text{TRUE}$ and $Y = \text{FALSE}$, Evaluate the following logical proposition. Please show your work.

   $$X \wedge (X \vee Y) \vee (X \wedge Y)$$

2. You are given a jar with 10 red marbles, 5 blue marbles, 15 yellow marbles, and 20 green marbles. Please find the following:

   (a) What proportion of the jar of marbles are red?

   (b) What proportion of the jar of marbles are blue?

   (c) If you drew one marble at random from the jar of marbles, what is the probability that you would draw a red marble?

   (d) If you drew two marbles at random from the jar of marbles (without replacing the first one you drew between draws), what is the probability that both marbles would be green?

3. Given the following set of numbers S, calculate several statistics. Please show your work.

$$S = 1, 3, 5, 7, 9, 11, 13, 15, 17, 19$$

   (a) What is the mean $\bar{x}$ of S?

   (b) What is the variance s^2 of S?

   (c) What is the standard deviation s of S?

4. Assume you and a classmate each created algorithms that can autonomously answer questions on your homework assignments for you. Answer the following questions:

   (a) Your program scores an average of 85% on your last nine homework assignments, with a standard deviation $s = 15\%$. What is the standard error SE of your program?

   (b) Your classmate's competing program scores an average of 80% with standard error $SE = 3\%$ over the same nine assignments. Calculate a 95% confidence interval describing the performance of your classmate's program (for simplicity, assume that $t_{0.025,8} = 2$).

   (c) Over the final three homework assignments, the performance of your algorithm has a 95% confidence interval of $90\% \pm 4\%$, whereas the performance of your classmate's algorithm has a confidence interval of $85\% \pm 3\%$. Did your algorithm significantly outperform your

classmate's algorithm (at an $\alpha = 0.05$ level)? Explain your reasoning.

(d) Would you and your classmate be violating the Honor Code with your algorithms?

5. Solve for the following derivatives. Please show your work.

   (a) $\frac{d}{dx}\frac{1}{2}(x-1)^2$

   (b) $\frac{d}{dx}\log(x)$

   (c) $\frac{d}{dx}x\log(x)$

6. Solve for the following partial derivatives. Please show your work.

   (a) $\frac{\partial}{\partial x}(x+y)$

   (b) $\frac{\partial}{\partial x}(x^2+y^2)$

   (c) $\frac{\partial}{\partial x}(x^2+xy+y^2)$

   (d) $\frac{\partial}{\partial x}\frac{1}{2}(x-y)^2$

HONOR CODE PLEDGE

If you have not violated the Honor Code while completing this assignment, please write below: "I have adhered to the Honor Code in this assignment."