CSE 5525 Speech and Language Processing (Spring 2017)
Homework #0: Background Review

Prof. Wei Xu, The Ohio State University

Due: 12:45PM, Wednesday, January 18th, 2016

Your Name: _____ OSU Username: _____

Instructions The goal of this homework is for you to refresh your mathematical and programming skills and determine whether you have the background needed to take this class. This homework will count 5% towards your final grade. Please finish by yourself and submit your completed solutions at the beginning of the class on next Wednesday.

1 Course Survey

Major:
Degree:
Year:

Prerequisites you have taken:
(☐ CSE 3521 or ☐ CSE 5521) and (☐ CSE 5522 or ☐ Stat 3460 or ☐ Stat 3470)

Other relevant courses you have taken :
☐ CSE 5523, ☐ CSE 5524, ☐ CSE 5526, ☐ CSE 5243, ☐ CSE 5539 in Speech/NLP, ☐ Ling 5802

Do you speak (or read) other languages other than English?

2 Probability [1 Point]

Two events A and B are such that $P(A) = 0.3$, $P(B) = 0.5$, and $P(A \cap B) = 0.1$, find the following probabilities: (show your the process of calculating)

(a) $P(A|B)$
(b) $P(A \cup B)$
(c) $P(A|(A \cup B))$
(d) $P(A|(A \cap B))$

(Please continue on the back.)

3 Calculus [1 Point]

If the function $z = e^{x^2 y}$ then, (show your the process of calculating; Hint: use the chain rule.)

(a) What is the derivative of z with respect to x?

(b) What is the derivative of z with respect to y?

4 Vectors and Matrices [1 Point]

Consider the matrix $\mathbf{X}$ and the vectors $\mathbf{y}$ and $\mathbf{z}$ below:

$$\mathbf{X} = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}, \mathbf{y} = \begin{bmatrix} -1 \\ 3 \end{bmatrix}, \mathbf{z} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$$

(a) What is $\mathbf{Xy}$?

(b) What is $\mathbf{y^T z}$, the inner product (also called dot product) of the vectors $\mathbf{y}$ and $\mathbf{z}$?

5 Python Programing [1 Point]

What is the result of this Python code?

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a = [1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9]
a [: : 2 ]
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6 Numpy Programing [1 Point]

Can you write the code that defines variables as matrix $\mathbf{X}$ and the vectors $\mathbf{y}$ and $\mathbf{z}$ in the above Question 4 Vectors and Matrices, then compute $\mathbf{Xy}$ and $\mathbf{y^T z}$? (This needs no more than several lines of code; Hint: take a look at Numpy tutorial.)