CPSC 340 Assignment 0

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1 Linear Algebra Review

1.1 Basic Operations

1. 14
2. 0
3. (6 10 14)
4. square root of 5
5. (0 1 2)
6. $\begin{bmatrix} 3 & 1 & 1 \\ 2 & 3 & 1 \\ 2 & 1 & 3 \end{bmatrix}$
7. $\begin{bmatrix} 6 \\ 5 \\ 7 \end{bmatrix}$

1.2 Matrix Algebra Rules

1. True
2. True
3. False
4. False
5. False
6. True
7. False
8. True.
9. True

1.3 Special Matrices

1. Symmetric matrix is a square matrix that is equal to its transpose.
2. Identity matrix is a square matrix in which all elements of principal diagonal are ones and all other elements are zeros. Any matrix multiplied by it will get itself.

3. Orthogonal matrix is a matrix where the transpose is equal to the inverse.

2 Probability Review

2.1 Rules of probability

1. 0.25
2. 4 dollars
3. 0.55

2.2 Bayes Rule and Conditional Probability

1. 0.010094
2. False positives
3. 0.00941153
4. Yes. The probability of a person is a drug user given that the test is true is very small.
5.

3 Calculus Review

3.1 One-variable derivatives

1. $\frac{14}{3}$
2. 0.25
3. 0
4. $\frac{-\exp(-x)}{1+\exp(-x)}$

3.2 Multi-variable derivatives

1. ($2x_1$, $\exp(x_2)$)
2. ($\exp(x_1 + x_2x_3)$, $x_3 \exp(x_1 + x_2x_3)$, $x_2 \exp(x_1 + x_2x_3)$)
3. (a_1 , a_2)
4. ($4x_1$ - $2x_2$, $2x_2$ - $2x_1$)
5. (x_1 , x_2 , x_3 , ... , x_d)

3.3 Derivatives of code

Done in code/grads.py

4 Algorithms and Data Structures Review

4.1 Trees

1. 2^l
2. 2^{l+1} - 1

4.2 Common Runtimes

1. O(nlgn)
2. O(n)
3. O(n)
4. O(nd)

4.3 Running times of code

1. O(N)
2. O(N)
3. O(1)
4. O(N^2)