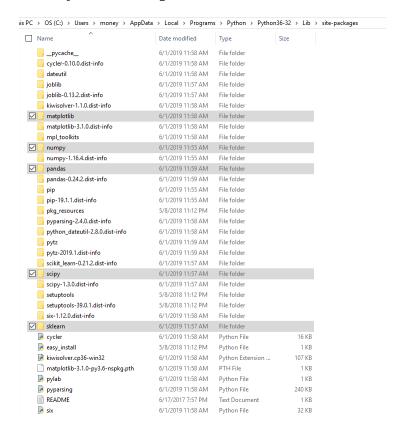
Homework 0

Colin May

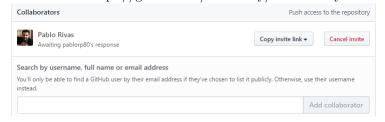
1 Python Requirements



2 Github

Github username: data440may

Github link: https://github.com/colinomay/data440may



3 Kaggle

User Name

colinomay

Your username cannot be changed.

Display Name

Colin May

The name users will see publicly. We recommend using your full name.

Email Address

colinmscs@gmail.com

4 Problems

4.1

For the function $g(x) = 3x^2 + 24x - 30$, find the value for x that maximizes g(x):

$$g(4) = 18$$

4.2

Consider the following function: $f(x) = 3x_0^3 - 2x_0x_1^2 + 4x_1 - 8$, what are the partial derivatives of f(x) with respect to x_0 and x_1 .

$$9x^2 - 4x_0x$$

4.3

(a) can you multiply the two matrices? elaborate on your answer:

No, because A is a 2x3 and B is also a 2x3 matrix, multiplication isn't possible.

(b) multiply A^T and B and give its rank.

$$\begin{bmatrix} -2 & -2 & 13 \\ 8 & 1 & 16 \\ 6 & -3 & -3 \end{bmatrix}$$

$$Rank = 2$$

(c) what is the result of $AB^T + C^{-1}$?

$$\begin{bmatrix} 15 & 15 \\ -12 & -16 \end{bmatrix}$$

```
import numpy as np
A = np.array([[1,4,-3],[2,-1,3]])
B = np.array([[-2,0,5],[0,-1,4]])

# (a)
#np.dot(A,B)

# (b)
np.dot(A.T,B)
np.linalg.matrix_rank(np.dot(A.T,B))

# (c)
C = np.array([[1,0],[0,2]])
np.dot(A,B,T)+C^-1
```

4.4

Simple Gaussian: the normal distribution with a mean of zero and a variance of one (the green curves in the plots to the right). It is often called the bell curve because the graph of its probability density looks like a bell.

Multivariate Gaussian: a generalization of the one-dimensional normal distribution to higher dimensions.

Bernoulli: the discrete probability distribution of a random variable which takes the value 1 with probability p and the value 0 with probability q=1-p.

Binomial: the discrete probability distribution of the number of successes in a sequence of n independent experiments.

Exponential: the probability distribution of the time between events in a Poisson point process, i.e., a process in which events occur continuously and independently at a constant average rate.

4.5

A Bernoulli random variable has two possible outcomes: 0 or 1. A binomial distribution is the sum of independent and identically distributed Bernoulli random variables.

4.6

$$X \sim N(2,3) = -7 < X < 11$$

4.7

4.8