Homework 0

Colin May

1 Python Requirements

Name	Date modified	Type	Size
__pycache__	6/1/2019 11:58 AM	File folder	
cycler-0.10.0.dist-info	6/1/2019 11:58 AM	File folder	
dateutil	6/1/2019 11:58 AM	File folder	
joblib	6/1/2019 11:57 AM	File folder	
joblib-0.13.2.dist-info	6/1/2019 11:57 AM	File folder	
kiwisolver-1.1.0.dist-info	6/1/2019 11:58 AM	File folder	
☑ matplotlib	6/1/2019 11:58 AM	File folder	
matplotlib-3.1.0.dist-info	6/1/2019 11:58 AM	File folder	
mpl_toolkits	6/1/2019 11:58 AM	File folder	
☑ numpy	6/1/2019 11:55 AM	File folder	
numpy-1.16.4.dist-info	6/1/2019 11:55 AM	File folder	
☑ pandas	6/1/2019 11:59 AM	File folder	
pandas-0.24.2.dist-info	6/1/2019 11:59 AM	File folder	
pip	6/1/2019 11:55 AM	File folder	
pip-19.1.1.dist-info	6/1/2019 11:55 AM	File folder	
pkg_resources	5/8/2018 11:12 PM	File folder	
pyparsing-2.4.0.dist-info	6/1/2019 11:58 AM	File folder	
python_dateutil-2.8.0.dist-info	6/1/2019 11:58 AM	File folder	
pytz	6/1/2019 11:59 AM	File folder	
pytz-2019.1.dist-info	6/1/2019 11:59 AM	File folder	
scikit_learn-0.21.2.dist-info	6/1/2019 11:57 AM	File folder	
☑ scipy	6/1/2019 11:57 AM	File folder	
scipy-1.3.0.dist-info	6/1/2019 11:57 AM	File folder	
setuptools	5/8/2018 11:12 PM	File folder	
setuptools-39.0.1.dist-info	5/8/2018 11:12 PM	File folder	
six-1.12.0.dist-info	6/1/2019 11:58 AM	File folder	
☑ sklearn	6/1/2019 11:57 AM	File folder	
cycler	6/1/2019 11:58 AM	Python File	16 KB
easy_install	5/8/2018 11:12 PM	Python File	1 KB
kiwisolver.cp36-win32	6/1/2019 11:58 AM	Python Extension ...	107 KB
matplotlib-3.1.0-py3.6-nspkg.pth	6/1/2019 11:58 AM	PTH File	1 KB
pylab	6/1/2019 11:58 AM	Python File	1 KB
pyparsing	6/1/2019 11:58 AM	Python File	240 KB
README	6/17/2017 7:57 PM	Text Document	1 KB
six	6/1/2019 11:58 AM	Python File	32 KB

2 Github

Github username: data440may

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

3   Kaggle

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