Noah Buchanan
Problem Set 1
ML at 6:50 PM

January 28, 2021

Critical Thinking

1. (a) 5x9
   (b) not possible
   (c) not possible
   (d) 9x7
   (e) not possible
   (f) not possible
   (g) 9x9
   (h) 5x7
   (i) 7x7

2. (a) $\begin{bmatrix} 6\cdot 6+1\cdot 1 & 6\cdot 3+1\cdot 2 & 6\cdot 7+1\cdot 9 \\ 3\cdot 6+2\cdot 1 & 3\cdot 3+2\cdot 2 & 3\cdot 7+2\cdot 9 \\ 7\cdot 6+9\cdot 1 & 7\cdot 3+9\cdot 2 & 7\cdot 7+9\cdot 9 \end{bmatrix}$
   $\begin{bmatrix} 37 & 20 & 51 \\ 20 & 13 & 39 \\ 51 & 39 & 130 \end{bmatrix}$
   (b) $\begin{bmatrix} 1\cdot 6+2\cdot 3+4\cdot 7 & 1\cdot 1+2\cdot 2+4\cdot 9 \\ 2\cdot 6+1\cdot 3+5\cdot 7 & 2\cdot 1+1\cdot 2+5\cdot 9 \\ 3\cdot 6+4\cdot 3+1\cdot 7 & 3\cdot 1+4\cdot 2+1\cdot 9 \end{bmatrix}$
   $\begin{bmatrix} 40 & 41 \\ 50 & 49 \\ 37 & 20 \end{bmatrix}$
   (c) cannot multiply 2x4 $\cdot$ 3x3

3. $\bar{x} = 3$
   $m = 2$

$s^2 = 4$
$s = 2$

4. sample space: 1,5,9

Probabilty Mass Function:	1	0.5
	5	0.3
	9	0.2

Ex(x) $= (1 \cdot 0.5) + (5 \cdot 0.3) + (9 \cdot 0.2) = 3.8$

Var(x) = E(x^2) - E(x)^2 = $\frac{\sum x_i^2}{N}$ - ($\frac{\sum x_i}{N}$)^2 = 10.67

5. Covar(X,Y) = -1.083
   Correlation(X,Y) = -0.204

   The covariance indicates towards there not being a relation rather than the vice versa and the correlation is very weak obviously in the case that there is a strong indication of no relation.

Programming Assignment

This is just so you can see what it output since we dont have a code server to put the code on there yet

```
first class accuracy and error:  0.6750700280112045 0.3249299719887955
gender accuracy and error:  0.7801120448179272 0.21988795518207283
age accuracy and error:  0.5938375350140056 0.4061624649859944
siblings or spouse accuracy and error:  0.5938375350140056 0.4061624649859944
parents or children accuracy and error:  0.6148459383753502 0.3851540616246498
embarked accuracy and error:  0.6162464985994398 0.3837535014005602
```

```
def majority(vector):
    count0 = 0
    count1 = 0

    for j in range(0, len(vector)):

        if vector[j] == 0:
            count0 += 1
        else:
            count1 += 1
```

```
    if count0 > count1:
        return count0

    return count1


read = open("C:\\Users\\noah_\\PycharmProjects\\MLPS1\\venv\\scripts\\data", "r")

fileData = read.readlines()

firstClass0 = []
firstClass1 = []
gender0 = []
gender1 = []
age0 = []
age1 = []
siblingSpouse0 = []
siblingSpouse1 = []
parentChild0 = []
parentChild1 = []
embarked0 = []
embarked1 = []

count = -1
#for skipping the headers^
for i in fileData:
    data = i.split("\t")

    if count>=0:
        # firstclassattr
        if int(data[0]) == 0:
            firstClass0.append(int(data[6]))
        else:
            firstClass1.append(int(data[6]))
        # genderattr
        if int(data[1]) == 0:
            gender0.append(int(data[6]))
        else:
            gender1.append(int(data[6]))
        # ageattr
        if int(data[2]) == 0:
            age0.append(int(data[6]))
        else:
            age1.append(int(data[6]))
        # siblingspouseattr
        if int(data[3]) == 0:
```

```
            siblingSpouse0.append(int(data[6]))
        else:
            siblingSpouse1.append(int(data[6]))
        # parentchildattr
        if int(data[4]) == 0:
            parentChild0.append(int(data[6]))
        else:
            parentChild1.append(int(data[6]))
        # embarkedattr
        if int(data[5]) == 0:
            embarked0.append(int(data[6]))
        else:
            embarked1.append(int(data[6]))

    count += 1
read.close()

firstClassAccuracy = (majority(firstClass0) + majority(firstClass1)) / 714
firstClassError = 1 - firstClassAccuracy
print("first class accuracy and error: ", firstClassAccuracy, firstClassError)

genderAccuracy = (majority(gender0) + majority(gender1)) / 714
genderError = 1 - genderAccuracy
print("gender accuracy and error: ", genderAccuracy, genderError)

ageAccuracy = (majority(age0) + majority(age1)) / 714
ageError = 1 - ageAccuracy
print("age accuracy and error: ", ageAccuracy, ageError)

siblingSpouseAccuracy = (majority(siblingSpouse0) + majority(siblingSpouse1)) / 714
siblingSpouseError = 1 - siblingSpouseAccuracy
print("siblings or spouse accuracy and error: ", siblingSpouseAccuracy, siblingSpouseError)

parentChildAccuracy = (majority(parentChild0) + majority(parentChild1)) / 714
parentChildError = 1 - parentChildAccuracy
print("parents or children accuracy and error: ", parentChildAccuracy, parentChildError)

embarkedAccuracy = (majority(embarked0) + majority(embarked1)) / 714
embarkedError = 1 - embarkedAccuracy
print("embarked accuracy and error: ", embarkedAccuracy, embarkedError)

# /*******************************
# Name: Noah Buchanan
# Username: ua
# Problem Set: PS1
# Due Date: January 28, 2021
```

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# ******************************/
```