**Tops technologies**

**Statics asignment for data analysis course**

**Question . (1)**

1.Harvard Law School courses often have assigned seating to facilitate the “Socratic method.” Suppose that there are 100 first year Harvard Law students, and each takes two courses: Torts and Contracts. Both are held in the same lecture hall (which has 100 seats), and the seating is uniformly random and independent for the two courses

1. Find the probability that no one has the same seat for both courses (exactly; you should leave your answer as a sum).

**Total course in hardvard law school course in 3 course in this school 1) socratic methods**

**2) torts and contracts are the two course are in law school in the afflicated in this school**

**-> individual 2 course are the 100 and 100 seat are the reserved that in this particular student are the one seat deserve.**

* **For the first course (Torts) there are 100 student are the 100 seat are the all the seat are the included in this course .**
* **Probability that the first student are 100 seat are the reserved that 1 seat 1/100second .second student are sits in the different seat is this included 99/100. Third student are th e this different seat in this included 978/100.**
* **All the student are the all the perticullar seat are the resrved for the both course seat in this law school.**

**(1/100)\*(99/100)\*(98/100)\*(97/100)……………..(3/100)\*(2/100)\*(1/100)**

**(this mean is that all the student are reserved for the seat)**

**-------------------------------------------------------------------------------------------------------------------------**

**Formula this 1st query**

**[(99 \* 98 \* ... \* 2 \* 1) / (100 \* 100 \* ... \* 100 \* 100)] \* [(99 \* 98 \* ... \* 2 \* 1) / (100 \* 100 \* ... \* 100 \* 100)]**

1. **) To find a simple approximation, we can use the fact that (1 - x/n)^n ≈ e^(-x) for large n. In our case, n = 100, and x is the number of students who have the same seat in both courses.**

**The probalbity is the no one has the same seat are the both course is approximatically.**

**E^(-x)**

**Answer --> two course are the same student is both course same seat is the 1% get the probability .**

**( C ) To find a simple approximation, we can use the fact that (1 - x/n)^n ≈ e^(-x) for large n. In our case, n = 100, and x is the number of students who have the same seat in both courses.**

**Answer :--**

**The probability that at least two student have the same seat for both courses is approximatically 1-e^(-x),where x si the number of students who hava the same in both courses.**

**Explanation:--**

**In this questiom ask there :- atleast two srtudent is the same course in reserved that both course .**

**1st student ) e^(-x)**

**2nd student ) 1-e^(-x)**

**2nd quesiition this assignment**

**There are 100 passengers lined up to board an airplane with 100 seats (with each seat**

**assigned to one of the passengers). The first passenger in line crazily decides to sit in a**

**randomly chosen seat (with all seats equally likely). Each subsequent passenger takes his or**

**her assigned seat if available, and otherwise sits in a random available seat. What is the**

**probability that the last passenger in line gets to sit in his or her assigned seat? in statics .**

**Answer:--**

**This problem thyoe has a demonstrate counterintuitive probability concet. This is both are the pasenger and variable are the straightforward.**

**--> if the pasenger 1 chooses their assigne individual (seat no. 1),.**

**--> if the last pasenger has seat the in your assigned seat .**

**-->in the other passenger are the assigned that individual seat. In this mean (1/100,2/100,3/100…..99/100,100/100).**

**--> if passenger 1 choose that k seat its mean( k ≠ 1 ) its mean pasenger 1 has the seated the (k seat) whenever k wil have lost the seat.**

**--> now passenger 2 have the choose the 2nd seat .**

**--> last passenger has will get the assigned seat.**

**Other passenger will get the subsequent seat this assigned the seat .**

**Question is there last pasenger has the find the probabilty .**

**Its mean that:-**

**(assignrd passenger seat ) =(a/1)+(b/2)+(c/3)…….(97/)+(98)+(100).**

**P(last passenger seat has the assigned ) = (1)+(2)+(3)……+(99)+(100)**

**Last passenger has the gets to sit in their assigned seat is 1/100.**

**Question no .(3)**. Raindrops are falling at an average rate of 20 drops per square inch per minute. What would be a reasonable distribution to use for the number of raindrops hitting a particular region measuring 5 inches2 in t minutes? Why? Using your chosen distribution, compute the probability that the region has no rain drops in a given 3 second time interval. A reasonable choice of distribution is P ?

Reasonable distribution is the one types of distribution types.

There are 7 types of the distribution

1. Normal distribution
2. Bionomial distribution
3. Exponial distribution
4. Uniform distribution
5. Poission distribution
6. Gama distribution
7. Log- multiply distibution

This question showled this poisoin distribution ( why) reason is that fix time accure the persquare in ch in 1 minute fix rain drop.

that’s why me are the use the poission distribution.

Event are the fix ti e accuring the fixted interval time ir space. In this question that rain drop are the rarely independent of othe factor.

In this question 20 drop accure in per square inch in 1 minute. In that’s case in this 5 min in raindrop calculate is the.

20\*5\*t= 100t

t= time

Pisiion distribution formula in this say

Posion distribution os the can’t be dependent of each other .

f(x) =(e– λ λx)/x!

e= is the called the base of logarithm

X= random variable

****Λ = average value ( 20 min drop per min in square inch )****

****Question query no .(2)****

****compute the probability that the region has no rain drops in a given 3 second time interval.****

****3 sec in convert to the minute****

****1min -------60sec****

****3 min --------(!)****

****3sec= 3/60 =00.5 min****

****Let the calculate the probability no raindrops (k=0)****

****No rain drop is the = 00.5****

****Posiion calculated distribution is the = 100times****

**E^(-x)**

P(0)=(e^(-100t)\*(100t)^0)/0!

****That s why 3 second are the in the accure the rain drop are the cant br poision distribution are the the can’t be calculated.****

****Question = 4****

Let X be a random day of the week, coded so that Monday is 1, Tuesday is 2, etc. (so X takes values 1, 2,..., 7, with equal probabilities). Let Y be the next day after X (again represented as an integer between 1 and 7). Do X and Y have the same distribution? What is P(X) ?

This question is the solwed by the distribution poision distribution is the uses that.

Reason is that (in week 7 day are the fix value) that’s why poision distribution is the best for the solwing the question.

X is the variable in this consider the week .

P(x=1)=p(monday) =1/7

P(x=2)=p(tuesday)= 1/7

P(x=3)=p(wednesday)= 1/7

P(x=4)=p(thursday)= 1/7

P(x=5)=p(friday)= 1/7

P(x=6)=p(saturday)= 1/7

P(x=7)=p(sunday)= 1/7

All the 7 day of the week in perficullar day fix value .

Possible values is the consider the dinoted the =y

Next day is the represent the consider the disnoted the = x

If x=1(monday) ,then y=2(tuesday)

If x=2(tuesday),then y=3(wednesday)

If x=3(wednesday),then y=4(thursday)

If x=4(thursday),then y=5(friday)

If x=5(friday),then y=6(saturday)

If x=6(saturday),then y=7(sunday)

If x=7(sunday),then y=1(monday)

= P(x)=p(x=1)+p(x=2)+p(x=3)+p(x=4)=p(x=5)+p(x=6)+p(x=7)

= 1/7 + 1/7 + 1/7 + 1/7 + 1/7 +1/7 +1/7

= 7/7

= 1

X and y distribution is the week of the is probability is the 1%.

Question :-

1. .For a group of 7 people, find the probability that all 4 seasons (winter, spring, summer, fall) occur at least once each among their birthdays, assuming that all seasons are equally likely ?

Answer:-

\* 7 people are the group

\* 4 season

Are the find the probability is the 7 people group in the at least 1 person is this season give the birthday.

There are 4 season so the total numbers of 7 people are the birthday is the 4 season

( 4^ 7)

Number of combinitions at least one missing season:-

\* Winter number of the commbition birthday in that season.

\* spring number of the commbition birthday in that season.

\* summer number of the commbition birthday in that season.

\* fall number of the commbition birthday in that season.

winter and spring missing | spring and summer missing

Winter and summer mising | spring and fall missing

Winter and fall mising |

Winter and summer mising |

Summer and fall missing | winter |spring | summer missing

| winter |spring | fall missing

| winter | summer | fall missing

|spring | summer | fall missing

| spring | summer | fall missing

4\*(3^7) -6\*(2^7)+4\*(1^7) - 0

42187 - 6128 - 4 \* 1

8748 -768 + 4

8012

Finally probability = 1 - (probability of a least one missing season)

= 1 -(total number of combinations at least one missing season / total number of combinations)

= 1 -( 8012 / 4^7)

= 1 - ( 8012 / 168384 )

= 1 - 0.489

= 0.511

Question .(6). Alice attends a small college in which each class meets only once a week. She is deciding between 30 non-overlapping classes. There are 6 classes to choose from for each day of the week, Monday through Friday. Trusting in the benevolence of randomness, Alice decides to register for 7 randomly selected classes out of the 30, with all choices equally likely. What is the probability that she will have classes every day, Monday through Friday?

Answer :--

Alice is the college student alice is meet is this college once week. Alice the 30 overlapping in this study. Alice is in week total six day are the 6 class in this week . alice is the trustinfg in the benelolence of randomly 30 lecture in only 7 leacture are the attrend .

\* first then 30 lecture in 7 weekend day filter 7 lecture calculate the probability.

C(30,7) = 30!/(7!\*(30 - 7)

7\*(23)

7 \* 161

30 / 1127

37.566667

Expected result are the calculated the in this result find the alice is the attend the regular leatures.

Expected result = 6 ^ 5 = 6\*6\*6\*6\*6\*6 =7776

Are the let’s calculate the alice the lecture are the attend persantage is the = 37.56 and total lecture are the probablility is the 7776 .

Lets find the calculate is the persantage of the total attendence of the leacture out of the 30 lecture in this week.

7776/37.56667

= 0.026

Are the alice is the total week of the attendence of the week is the persantage is the . 0.26 % attendence the lecture in week.

Quesation no.(7). Is it possible that an event is independent of itself? If so, when?

Answer :- no

Its is not possibile for an event to be independent of itself . indepence in probability and statics referss to the concept.

In statics are the referes two side of the result.

1. Occurance ( succesfull accur this event )
2. Non - occurance (falure )

In two order are the two event are the term and condition are the first event are not affectance for the other event dependent.

It is the result about the statically and mathecally are the justify the result is the some a and b event are the accur any dependent event acuurance.

P(a) \* p(b) = event

Question = (8)

Is it always true that if A and B are independent events, then Ac and Bc are independent events? Show that it is, or give a counterexample ?

Answer :--

Basically a and b has individual event. In this reason but ac , and bc are the independent event.

\* it mean a,b ,ac ,bcc are the individual event in that is case .

\* let me explain some example :- rohan is take the umbrella is the event some pass the few times let’s just decided the of a is the independent event .

\* ac = it is next rain is not going

\* b =rohan today is umbrella iss take or not in tommorrow.

\* bc = umbrela take canot just probablility.

\* ac = rohan is the can’t a umbrell this day rain is come.

P = rohan take umbrella.

P = (( ac) and added (bc) ) = p( next day is can’t going rain and rohan can’t take a umbrella .) = p ( it will not rain tommrrow) \* p( john will not bring the umbrella)

Formula : -

P(ac) \*p(bc) = (1-p(a)) \* (1-p(b))

Explanation : -

P (not rain tommorrow) \* p(rohan is the not bring the umbrella )

Question ;- (9)

1. Give an example of 3 events A, B, C which are pairwise independent but not independent. Hint: find an example where whether C occurs is completely determined if we know whether A occurred and whether B occurred, but completely undetermined if we know only one of these things ?

P(a)\*p(b)\*p(c) = (1/2)\*(1/2)\*(1/3) = 1/12

Answer :-

Some question a,b,c are the some example this some group are the independent or dependent or c is the event are the accur surely expected a ,b event are the accur but this event are the completely unexpected .

Let me some explain a example . 6 side box are the 3 probability

1. Less than 3 number of die (2,4,6)
2. Same number of die (1,2,or 3)
3. Prime number (2,or 3)

P(a) = 3/6 =1/2 p(b)=3/6=1/2 p©=2/6 = 1/3

P(a)\*p(b)\*p(c) = (1/2)\*(1/2)\*(1/3)

= 1/12

= 12

Question :- 10

1. A bag contains one marble which is either green or blue, with equal probabilities. A green marble is put in the bag (so there are 2 marbles now), and then a random marble is taken out. The marble taken out is green. What is the probability that the remaining marble is also green?

Answer:- one bag in 2 color marble stone plate.

1. Green marble
2. Blue marble

Bag open the bag let me select the open the bag and first stone is the green conditional probability that can use.

G1 = first marble selected is green

G2 = second marble ( remaining is the pridicted ) green

First thenc then selected first marble is the green and unfortunaly second marble stone is the ( green/ blue ) .

Find the Probability :-

1st marble plate is color is the green and 2nd marble is the probability predicted In green but blue marble is the not selected.

Then green marble stone probability is the . 1 or 100 % second marble is the green % is the 1%.

Question no (11)

A group of n 2 people decide to play an exciting game of Rock-Paper Scissors. As you may recall, Rock smashes Scissors, Scissors cuts Paper, and Paper covers Rock (despite Bart Simpson saying “Good old rock, nothing beats that!”). Usually, this game is played with 2 players, but it can be extended to more players as follows. If exactly 2 of the 3 choices appear when everyone reveals their choice, say a, b 2 {Rock, Paper, Scissors} where a beats b, the game is decisive: the players who chose a win, and the players who chose b lose. Otherwise, the game is indecisive and the players play again. For example, with 5 players, if one player picks Rock, two pick Scissors, and two pick Paper, the round is indecisive and they play again. But if 3 pick Rock and 2 pick Scissors, then the Rock players win and the Scissors players lose the game. 1 Assume that the n players independently and randomly choose between Rock, Scissors, and Paper, with equal probabilities. Let X, Y, Z be the number of players who pick Rock, Scissors, Paper, respectively in one game.

1. Find the joint PMF of X, Y, Z.
2. Find the probability that the game is decisive. Simplify your answer (it should not involve a sum of many terms).
3. (c) What is the probability that the game is decisive for n = 5? What is the limiting probability that a game is decisive as n ! 1? Explain briefly why your answer makes sense

Answer :-

This answer givwe the using the probability mass function.

Probablility mass function is the discrete random variable . it assciates to any given number of the probability that random variable will be equal to that number.

Formula :- f(x)=P[X=x]. f ( x ) = P [ X = x ]

2 people are decode the let me some playing game .

Gmae :- stone , paper ,season

1. Joint pmf of x,y,z : to determine the join pmf we need the possible outcomes of the game.

Exactly two of the choice appear

Rock and scissors appear (x,y,z) = (m,m,n):

The number of choose m players out of n to play rock given the bionomial coefficient c(n,m)

Rock and scissor appear (x,y,z )= (m,m,n ):

P(x = 2 y= 2 z=5)= c(5,2)\*c(5,2)\*(1/3)^(22)\*(1/3)^22 \*(1/3)^(5-2\*2)

10\*10\*(1/3)^4\*(1/3)^4(1/3)^1

100\*(1/81)\*1(1/81)\*(1/3)

100/2187

0.0458

1. Probablility that game is decisive : to find the probability that the game is decisive need sum the joint probabilities all decisive cases:-

(b)(b) Find the probability that the game is decisive. Simplify your answer (it should not involve a sum of many terms).

P(X = m, Y = n, Z = m) = C(n, m) \* C(n, m) \* (1/3)^(2m) \* (1/3)^(n-2m) \* (1/3)^(2m).

(x,y,z)=(2,5,2)

P(x=2,y=5,z=2)=c(5,2)\*c(5,2)\*(1/3)^(22)\*(1/3)^(5-22)\*(1/3)^(2\*2)

10 \* 10 \* (1/3)^4 \* (1/3)^1 \* (1/3)^4

100 \* (1/81) \* (1/3) \* (1/81)

100/2187

0.0458

1. What is the probability that the game is decisive for n = 5? What is the limiting probability that a game is decisive as n ! 1? Explain briefly why your answer makes sense.

P(decisive) = P(X = 2, Y = 2, Z = 5) + P(X = 2, Y = 5, Z = 2) + P(X 5, Y = 2, Z = 2)

0.0458 + 0.0458 + 0.0458

0.1374

Therefore the probavbility that the game is decisive for n = 5 is approximately 0.1374%.

Question =(12)

. A spam filter is designed by looking at commonly occurring phrases in spam. Suppose that 80% of email is spam. In 10% of the spam emails, the phrase “free money” is used, whereas this phrase is only used in 1% of non-spam emails. A new email has just arrived, which does mention “free money”. What is the probability that it is spam?

Spam filter basically occurring design in spam.

80% spam of email spam.

10% spam of email free spam.

1% spam non spam email free money.

Just new email is arrived “free money email” find the probability.

P(a)=0.8(email spam)

P(b)=0.1(email free spam)

P(b1)=0.01(non email free momey spam)

We want to find the probability is the p(a|b)

80% spam of email spam.

=P(a|b)=((p(b|a) \* p(a)/p(b))

10% spam of email free spam = P(b)=p(b|a)\*p(b|a’)\*(1-p(a’))

1% spam non spam email free money.

=P(b’)=p(b|a)\*p(b|a’)\*(1-p(a’))

Now we final find the the total free money spam is the .

P(a|b)=p(b|a)\*p(a))/[p(b|a)\*p(a)+p(b|a)\*(1-p(a)]

=(0.1\*0.8)/[(0.1)\*(0.8)+(0.01\*(1-0.8

)]

00.8/(00.8+00.2)

00.8/00.82

0.9756

Free money spam probability is the 0.9756% spam free money.

Question:-13

A crime is committed by one of two suspects, A and B. Initially, there is equal evidence against both of them. In further investigation at the crime scene, it is found that the guilty party had a blood type found in 10% of the population. Suspect A does match this blood type, whereas the blood type of Suspect B is unknown. (a) Given this new information, what is the probability that A is the guilty party? (b) Given this new information, what is the probability that B’s blood type matches that found at the crime scene?

This answer the solved thr bayes thereom states is the conditional formating and event the occurance of the another event .second event given the same first event mutiplied by the probability pf the first event.

Formula :- ->

This bayes formula is that use the first event values dependent

Releted event values probabilities

P(a|b)=p(b|a)p(a)

\_\_\_\_\_\_\_\_\_\_\_\_\_

P(b)

Using the bayes therom:- p(t|b)=(p(b|t)\*p(t)/p(b)

Lets solwed the question:- some asking the question the two people are the crime comitted by . two crime in one people is the

\* starting in same evidence this case proovement.

1. A = 10% gualty party had blood 10% population.
2. b = not same blood population
3. Given the a is the criminalist .
4. Then b is give the some new information that crime scene not found the b person blood

Using bayes therom:- p(a)=p(b) =0.5(equal evidence)

P(T|A)= 1 ( a match the blood is the suspect the crime scene.

P(t|b)=0.1 (b person blood are the same suspect the crime scene)

P(a)=0.5

P(b)=0.5

1. Given this new information, what is the probability that A is the guilty party?

P(a|b) =p(b|a) \* p(a)

\_\_\_\_\_\_\_\_

P(b)

Calculate the total probability formula :--

P(T) = P(T|A) \* P(A) + P(T|B) \* P(B)

P(a|t)=((1)\*0.5)/(1\*0.5)+(1=0.5)

0.5/(0.5+0.05)

0.5/0.55

0.9091

(b) Given this new information, what is the

probability that B’s blood type matches that found at the crime scene?

Question :- 14

14. You are going to play 2 games of chess with an opponent whom you have never played

against before (for the sake of this problem). Your opponent is equally likely to be a

beginner, intermediate, or a master. Depending on

(a) What is your probability of winning the first game?

(b) Congratulations: you won the first game! Given this information, what is the probability

that you will also win the second game

(c) Explain the distinction between assuming that the outcomes of the games are

independent and assuming that they are conditionally independent given the opponent’s

skill level. Which of these assumptions seems more reasonable, and why?

Let give the

Answer : - ->

We are playing in chess eva people that are not studing in never play this game.

A and b are the playing some chess game. And both people are playing never chess one people are the b are the play chess the find the probability is the b people play some a is the ( beginnner, intermediate , master.).

1. What is your probability of winning the first game?

Lets assuming the start is the game is the begginer have limited expereince wining match probability is the chess wining probavbility is the 0.8%.

Intermediate winnig the lowest to intermediate wininig the match probability is the 0.5%.

Lower to advanced skill strategies let’s assummmes the win the chees match probability is the 0.2%.

P(win)= (0.8\*1/3)+(0.5\*1/3)+(0.2\*1/3)

P=0.267+0.167+0.067

P= 501

Approximatelly 50.1%

(b) Congratulations: you won the first game! Given this information, what is the probability

that you will also win the second game

This question is the a the asking the intermediate, lowest skill approved people are the first game the are the winning . and master the losss the the firt game excperience.

1. Lowest :- lowest skiil aprrved the playing the some chess playing the first game and the you are the winnig the match is the . the second would likely remain the high ,asumming the skil level.
2. Intermediate :- intermediate are the first the winngi the match this person I skill leavel and improvement and chess playing some extra skill is the upgrade.
3. Master:- master people are first match the loss them your find some mistake as upgrade the your masters skill level and then next match the winnig probability is the high.

(c) Explain the distinction between assuming that the outcomes of the games are

independent and assuming that they are conditionally independent given the opponent’s

skill level. Which of these assumptions seems more reasonable, and why?

This answer :- ->

Lets final result is the coming ………

Assuming the outcomes of the games are independent means that the result of one game does not affect the result of the other. In this case, winning or losing the first game would not influence the probabilities of winning .the second game. Each game is treated as a separate event, and the opponent's skill level remains the same throughout.

Queation :- ->15

1. A chicken lays n eggs. Each egg independently does or doesn’t hatch, with probability p of hatching. For each egg that hatches, the chick does or doesn’t survive (independently of the other eggs), with probability s of survival. Let N ⇠ Bin(n, p) be the number of eggs which hatch, X be the number of chicks which survive, and Y be the number of chicks which hatch but don’t survive (so X + Y = N). Find the marginal PMF of X, and the joint PMF of X and Y . Are they independent ?

Answer description :--

This question answer this using probability types the marignal probability mass function. Using

(X=k)

X= bachela bachha ni number

S= all the chick are the surive the egg independatly surrivies

X= bachhi gayela bachha ni number 0 to n number of egg bachha tethi x is

Y= is called the je bachha bahar nikle chhe pan jivta nathi.

N= is the bachha bahar nikle chhe pan jivta nathi tenu calculation chhe.

the marginal probability mass function

P(x=k)=p(x=k,y=n-k)

Now let’s find the individualy x,y probablility find that .

X+y =n

Thats marginal probability mass function :--

P(x=x,y=y)=p(x=x,y=n-x)