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Class and Section: EGR 223 -02

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Laboratory # 3

Laboratory Title: Writing MATLAB Function and Bernoulli Trials

Date: 01/31/20

Introduction:

The main goal of this laboratory was to practice creating simulations for Total Probability Theorem and Bayes’ Rule. And, explore more on custom made functions in MATLAB.

Procedure:

PRELAB

Missile target practice problem (discussed in class but restated here with modified numbers): Suppose that independent missiles A, B and C have probabilities 0.52, 0.48 and 0.375 of hitting a practice target, respectively. Assume that the target will be destroyed with probability 0.25 if hit by a single missile, 0.49 if hit with two missiles and 0.88 if hit by all three missiles. Find:

1. The probability that the target is destroyed

Let   
D = {Target was destroyed}  
H0= {0 missile hit}  
H1= {1 missile hit}  
H2= {2 missile hit}  
H3= {3 missile hit}  
A = {A hit}  
B = {B hit}  
C = {C hit}

From question  
P(A) = 0.52 P(D|H0) = 0  
P(B) = 0.48 P(D|H1) = 0.25  
P(C) = 0.375 P(D|H2) = 0.49  
 P(D|H3) = 0.88

Using Total probability theorem  
P(D) = P(D|H0) P(H0) + P(D|H1) P(H1) + P(D|H2) P(H2) + P(D|H3) P(H3)

P(H0) = p (One missile hit)  
 =P(A`\*B`\*C`)  
 = 0.48\*0.52\*0.625  
 = 0.156

P(H1) = (one missile hit)  
 = P(AB`C` + A’BC’ + A’B’C)  
 = 0.4066

P(H2) = (Two missile hit)  
 = P(ABC` + A`BC + ABC`)  
 = 0.3438

P(H3) = (Three missile hit)  
 = P(A) P(A) P(C)  
 = 0.0936

P(D) = P(D|H0) P(H0) + P(D|H1) P(H1) + P(D|H2) P(H2) + P(D|H3) P(H3)  
 = 0.25\*0.4066 + 0.49\*.3438 + 0.88\*0.0936  
 = 0.35248

b) The probability that the target is destroyed by a single missile knowing that it is destroyed.  
P(H1|D) =

=

= 0.288

c) The probability that the target is destroyed by missile B knowing that it is destroyed.  
P(B|D) = ?

P(B|D) = P(D|B) \* P(A) / P(D)

P(D|B) = P(D|H1) P(A’C’) + P(D|H2) (P(A’C) + P(AC’)) + P(D|H3) P(AC)

= 0.49405

A company producing electric relays has three manufacturing plants producing 33, 42 and 25 percent, respectively, of its product. Suppose that the probabilities that a relay manufactured by these plants is defective are 0.01, 0.005 and 0.03, respectively.

Let   
A = relay produced by company A   
B = relay produced by company B  
C = relay produced by company C  
D = defective relay

From the question   
P(A) = 0.33 P(D|A) = 0.01  
P(B) = 0.42 P(D|B) = 0.005  
P(C) = 0.25 P(D|C) = 0.03

a) P(D) = ?  
P(D) = P(D|A) P(A) + P(D|B) P(B) + P(D|C) P(C)  
 = 0.0129

b) P(C|D) = ?

P(C|D) =   
 = 0.5814

After solving problem 1 & 2 theoretically, a missile.m function was created as part of pre-lab.