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on Oct 24, 2019  10[View code](#) README.md

Bayes' Theorem - Lab

Introduction

In this lab, you'll practice Bayes' Theorem in some simple word problems.

Objectives

In this lab you will be able to:

- Use Bayes' theorem to determine the probability of specific events

Define a custom function for Bayes' theorem

To start, write a function, `bayes()`, which takes in the probability of A, the probability of B, and the probability of B given A. From this, the function should then return the conditional probability of A, given that B is true.

```
def bayes(P_a, P_b, P_b_given_a):  
    # Your code here  
    P_a_given_b = (P_b_given_a * P_a)/P_b  
    return P_a_given_b
```

Skin Cancer

After a physical exam, a doctor observes a blemish on a client's arm. The doctor is concerned that the blemish could be cancerous, but tells the patient to be calm and that it's probably benign. Of those with skin cancer, 100% have such blemishes. However, 20% of those without skin cancer also have such blemishes. If 15% of the population has skin cancer, what's the probability that this patient has skin cancer?

Hint: Be sure to calculate the overall rate of blemishes across the entire population.

```
# Your code here  
P_b = 1*.15 + .85*.2  
P_cancer_given_blemish = bayes(.15, P_b, 1)  
print(P_cancer_given_blemish)
```

0.46875

Children (I)

A couple has two children, the older of which is a boy. What is the probability that they have two boys?

```
# Your solution P(2boys|older child is a boy)  
P_a = 1/4 # Probability of 2 boys  
P_b = .5 # Probability older child is a boy  
P_b_given_a = 1 # Probability older child is a boy if 2 boys  
bayes(P_a, P_b, P_b_given_a)
```

0.5

Children (II)

A couple has two children, one of which is a boy. What is the probability that they have two boys?

```
# Your solution P(2boys|1 of 2 children is a boy)
P_a = 1/4 # Probability of 2 boys
P_b = 3/4 # Probability 1 of 2 children is a boy
P_b_given_a = 1 # Probability of 1 of 2 children being a boy, given both are boys
bayes(P_a, P_b, P_b_given_a)
```

0.3333333333333333

A diagnostic test

A diagnostic test is advertised as being 99% accurate

- If a patient has the disease, they will test positive 99% of the time
- If they don't have the disease, they will test negative 99% of the time
- 1% of all people have this disease

If a patient tests positive, what is the probability that they actually have the disease?

```
# Your solution
P_a = .01 # Probability of disease
P_b = (0.01*0.99) + (0.99 *0.01) # Probability of testing positive
P_b_given_a = .99 # Probability of testing positive given disease
bayes(P_a, P_b, P_b_given_a)
```

0.5

Summary

In this lab, you practiced a few simple examples of Bayesian logic and how you can add prior information to update your beliefs about the chance of events.

Releases

No releases published

Packages

No packages published

Contributors 4



ShakeelRaja Shakeel Raja



LoreDirick Lore Dirick



sumedh10 Sumedh Panchadhar



mathymitchell

Languages

● Jupyter Notebook 100.0%