STA380_James_Problems

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2024-07-31

Problem 1

We are looking for P(Yes|TC) P(Yes|RC) = .5 P(No|RC) = .5 P(Yes) = .65 P(No) = .35 P(RC) = .3

The total law of probability states that P(A) = the summation of P(A|B) * P(B) The P(Yes) comes from only two conditional probabilities: P(Yes|RC) and P(Yes|TC) So P(Yes)=P(Yes RC)P(RC)+P(Yes TC)P(TC) Using some algebra I can arrange this to (P(Yes) - P(Yes|RC)P(RC)) / P(TC) = P(Yes TC) Thus, P(Yes|TC) is **71.43%**

Part B

Sensitivity = P(P|D) = .993 Specificity = P(N|ND) = .9999 Disease = P(D) = .000025 The question we are solving is: What is the P(D|P)? Bayes Theorem is P(D|P) = (P(P|D)*P(D)) / P(P) We have P(P|D) and P(D), so we need to find P(P). This will require using the rule of total probability So P(P) = P(P|D) P(D) + P(P|ND) * P(ND) So we need P(ND) and P(P|ND) No disease = P(ND) = 1 - P(D) = .999975 P(P|ND) = 1 - P(N|ND) = .0001 (This is the False Positive case) P(P) = .00012 After calculating all of my needed info and applying Bayes Theorem, I get that the Probability of a person having the disease given a positive test is *19.88%*

```
p_yes_rc = .5
p_no_rc = .5
p_yes = .65
p_no = .35
p_rc = .3
p_tc = .7
p_yes_tc = (p_yes-p_yes_rc*p_rc) / p_tc
print(p_yes_tc)
```

```
## [1] 0.7142857
```

```
# Part B
sensitivity = .993
specificity = .9999
disease = .000025
no_disease = 1- disease
no_disease
```

```
## [1] 0.999975
```

```r
false_postive = 1 - specificity
false_postive
```

```
## [1] 1e-04
```

```r
positive = sensitivity * disease + false_postive * no_disease
positive
```

```
## [1] 0.0001248225
```

```r
disease_given_positive = (sensitivity * disease)/ positive
print(disease_given_positive)
```

```
## [1] 0.1988824
```

Including Plots

You can also embed plots, for example:

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.