FA3

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Question (2)

2. A binary communication channel carries data as one of two sets of signals denoted by 0 and 1. Owing to noise, a transmitted 0 is sometimes received as a 1, and a transmitted 1 is sometimes received as a 0. For a given channel, it can be assumed that a transmitted 0 is correctly received with probability 0.95, and a transmitted 1 is correctly received with probability 0.75. Also, 70% of all messages are transmitted as a 0. If a signal is sent, determine the probability that:

a. a 1 was received;
b. a 1 was transmitted given than a 1 was received.

We have the following probabilities:

** Given Information **

- $P(R_0|T_0)$ - Probability of receiving a 0 when a 0 is transmitted (correctly received 0): 0.95.
- $P(R_1|T_1)$ - Probability of receiving a 1 when a 1 is transmitted (correctly received 1): 0.75.
- $P(T_0)$ - Probability of transmitting a 0: 0.70.

(a) Probability that a 1 was received

Using the law of total probability, we can calculate the probability of receiving a 1:

##Probability of Receiving a 1 (a)

Using the law of total probability:

P(R1)=P(R1∣T0)⋅P(T0)+P(R1∣T1)⋅P(T1)

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## [1] 0.89
```

(b) Probability that a 1 was transmitted given that a 1 was received

Using Bayes' Theorem

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## [1] 0.252809
```

Question (7)

There are three employees working at an IT company: Jane, Amy, and Ava, doing 10%, 30%, and 60% of the programming, respectively. 8% of Jane's work, 5% of Amy's work, and just 1% of Ava's work is in error. What is the overall percentage of error? If a program is found with an error, who is the most likely person to have written it?

Get overall percentage error

The overall percentage of error (P(E)) can be calculated using the law of total probability:

P(E)=P(E∣J)⋅P(J)+P(E∣A)⋅P(A)+P(E∣V)⋅P(V)

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## [1] 0.029
```

Probability of Each Employee Given an Error

calculate the conditional probabilities of each person given an error:

$P(J|E)=P(E|J)\cdot P(J)/P(E)$

$P(A|E)=P(E|A)\cdot P(A)/P(E)$

$P(V|E)=P(E|V)\cdot P(V)/P(E)$

```
## [1] 0.2758621 0.5172414 0.2068966
```

##The probabilities of each employee writing a program with an error are approximately:

```
## [1] "Amy"
```

as we can see amy has the highest approximation for the error in writing a program.