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Intro to AI

Professor Hoenigman

Assignment 6

1. P(HBP) =

P(HBP) =

P(HBP) = 0.6\*0.2\*0.5 + 0.72\*0.2\*0.5 + 0.33\*0.8\*0.5 + 0.51\*0.8\*0.5

P(HBP) = 0.47

1. P(HD) =

P(HD) =

Here’s a table for each component and then summed at the bottom

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ath | HBP | FH | P(HD) | P(Ath) | P(HBP) | P(FH) | P(HD,Ath,HBP,FH) |
| y | y | y | 0.92 | 0.53 | 0.47 | 0.15 | 0.03 |
| y | y | n | 0.91 | 0.53 | 0.47 | 0.85 | 0.19 |
| y | n | y | 0.81 | 0.53 | 0.53 | 0.15 | 0.03 |
| y | n | n | 0.77 | 0.53 | 0.53 | 0.85 | 0.19 |
| n | y | y | 0.75 | 0.47 | 0.47 | 0.15 | 0.02 |
| n | y | n | 0.69 | 0.47 | 0.47 | 0.85 | 0.13 |
| n | n | y | 0.38 | 0.47 | 0.53 | 0.15 | 0.01 |
| n | n | n | 0.23 | 0.47 | 0.53 | 0.85 | 0.05 |
| Total | | | | | | | 0.66 |

P(HD) = 0.66

1. P(HD | Rapid) =

P(HD | Rapid) =

P(HD | Rapid) =

P(HD | Rapid) = 0.86

1. P(HBP | HD, FH) =

First I need to figure out the P(HD, FH) which is shown by the following table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ath | HBP | FH | P(HD) | P(Ath) | P(HBP) | P(FH) | P(HD,Ath,HBP,FH) |
| y | y | y | 0.92 | 0.53 | 0.46 | 0.15 | 0.03 |
| y | n | y | 0.81 | 0.53 | 0.54 | 0.15 | 0.03 |
| n | y | y | 0.75 | 0.47 | 0.46 | 0.15 | 0.02 |
| n | n | y | 0.38 | 0.47 | 0.54 | 0.15 | 0.01 |
| Total | | | | | | | 0.11 |

Now, I can use this data to find the P(HD,FH, HBP) with the following data points:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ath | HBP | FH | P(HD) | P(Ath) | P(HBP) | P(FH) | P(HD,Ath,HBP,FH) |
| y | y | y | 0.92 | 0.53 | 0.46 | 0.15 | 0.03 |
| n | y | y | 0.75 | 0.47 | 0.46 | 0.15 | 0.02 |
| Total | | | | | | | 0.06 |

Now I just put everything into the equation to solve:

P(HBP | HD, FH) =

P(HBP | HD, FH) = 0.55

1. P(Sm | HD) =

P(Sm | HD) =

Now, I can find the probability of Heart Disease given High Blood Pressure by adding the different probabilities

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ath | HBP | FH | P(HD) | P(Ath) | P(HBP) | P(FH) | P(HD,Ath,HBP,FH) |
| y | y | y | 0.92 | 0.53 | 1 | 0.15 | 0.07 |
| y | y | n | 0.91 | 0.53 | 1 | 0.85 | 0.41 |
| n | y | y | 0.75 | 0.47 | 1 | 0.15 | 0.05 |
| n | y | n | 0.69 | 0.47 | 1 | 0.85 | 0.28 |
| Total | | | | | | | 0.81 |

The P(HBP,Sm) =

P(HBP,Sm) = 0.6\*0.5\*1 +0.72\*0.5\*1

P(HBP,Sm) =0.66

Now, I just substitute everything into the equation and solve.

P(Sm | HD) =

P(Sm | HD) =

P(Sm | HD) = 0.07

1. The probability in question 5 would increase because now you know that the person has high blood pressure which can be caused by smoking. Because of this, you don’t need to multiply by P(HBP) in the above equation. As such, the numerator is larger increasing the probability to 0.16.
2. P(Me|Ang) =

First we solve for P(HBP,ME) which is:

The P(HBP,ME) =

P(HBP,ME) = 0.6\*1\*0.2 + 0.33\*1\*0.8

P(HBP,ME) =0.38

We can calculate the P(Ang) as well:

P(Ang) =

P(Ang) = 0.85\*0.66+0.4\*0.34

P(Ang) = 0.70

As we’ve solved for the other probabilities above, we can just substitute everything into the equation in order to solve:

P(Me|Ang) =

P(Me|Ang)= 0.058