



MITx: 6.041x Introduction to Probability - The Science of Uncertainty



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Problem 2: Busy signal

(2/2 points)

Suppose that you move to a new house and you are 10% sure that your new house's phone number is 561290. To verify this, you use the house's phone to dial 561290, obtain a busy signal, and conclude that this is indeed your phone number. (Suppose that you were incorrect, and that this is somebody else's phone number. In that case, you will receive a busy signal if and only if that person is making a phone call at the same time. But if you call your own number, you will always receive a busy signal.)

Assume that the probability of a random six-digit phone number being in use at any given time is 0.001. What is the probability that you will be correct in concluding that 561290 is indeed your own phone number? Your answer should be accurate to 3 decimal places.




Answer: 0.99108

Answer:

Let A be the event that your phone number is 561290. Let B be the event that the number 561290 is in use when you dial it. By Bayes' rule, we have

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Final Exam

Final Exam due May 24, 2016 at 23:59 UTC 

$$\begin{aligned}
 \mathbf{P}(A \mid B) &= \frac{\mathbf{P}(A)\mathbf{P}(B \mid A)}{\mathbf{P}(B)} \\
 &= \frac{(0.1)(1)}{\mathbf{P}(A)\mathbf{P}(B \mid A) + \mathbf{P}(A^c)\mathbf{P}(B \mid A^c)} \\
 &= \frac{(0.1)(1)}{(0.1)(1) + (0.9)(0.001)} \\
 &\approx 0.99108.
 \end{aligned}$$

You have used 1 of 2 submissions



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