



- Introduction
- 1. Probability and Inference

### Introduction to Probability (Week 1)

Exercises due Sep 21, 2016 at 21:00 UTC

### Probability Spaces and Events (Week 1)

Exercises due Sep 21, 2016 at 21:00 UTC

### Random Variables (Week 1)

Exercises due Sep 21, 2016 at 21:00 UTC

#### Jointly Distributed Random Variables (Week 2)

Exercises due Sep 28, 2016 at 21:00 UTC

## Conditioning on Events (Week 2)

Exercises due Sep 28, 2016 at 21:00 UTC

#### Homework 1 (Week 2)

Homework due Sep 28, 2016 at 21:00 UTC

#### Inference with Bayes' Theorem for Random Variables (Week 3)

Exercises due Oct 05, 2016 at 21:00 UTC

### Independence Structure (Week 3)

Exercises due Oct 05, 2016 at 21:00 UTC

### Homework 2 (Week 3)

Homework due Oct 05, 2016 at 21:00 UTC

### Notation Summary (Up Through Week 3)

#### Mini-project 1: Movie Recommendations (Week 3)

Mini-projects due Oct 12, 2016 at 21:00 UTC

1. Probability and Inference > Inference with Bayes' Theorem for Random Variables (Week 3) > Exercise: Bayes' Theorem for Random Variables - Medical Diagnosis, Continued

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# Exercise: Bayes' Theorem for Random Variables - Medical Diagnosis, Continued

(4/4 points)

Recall the medical diagnosis setup from before, summarized in these tables:

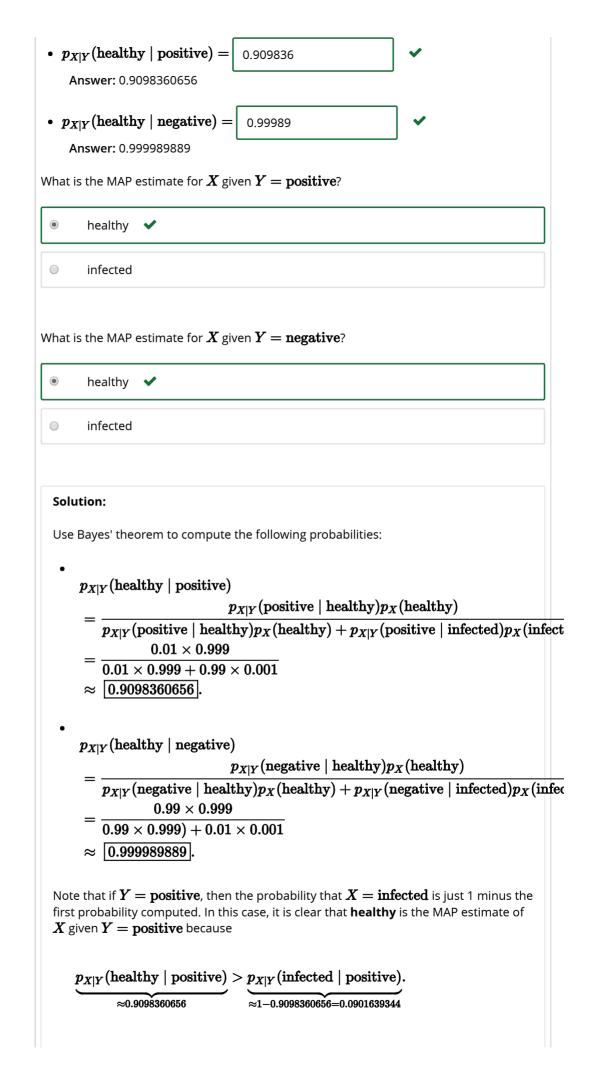
$$\begin{array}{c} X \\ p_{Y\mid X} \\ \text{healthy infected} \\ \\ \text{positive} \\ Y \\ \text{negative} \begin{array}{c|c} 0.01 & 0.99 \\ \hline 0.99 & 0.01 \\ \end{array}$$

Recall that Bayes' theorem is given by

$$p_{X\mid Y}(x\mid y) = rac{p_X(x)p_{Y\mid X}(y\mid x)}{\sum_{x'}p_X(x')p_{Y\mid X}(y\mid x')}$$

for all values  $m{x}$  that random variable  $m{X}$  can take on.

Use Bayes' theorem to compute the following probabilities: (Please be precise with at least 3 decimal places, unless of course the answer doesn't need that many decimal places. You could also put a fraction.)



Similarly, if  $oldsymbol{Y} = \mathbf{negative}$ , the MAP estimate for  $oldsymbol{X}$  is still  $oldsymbol{healthy}$  since

$$\underbrace{p_{X|Y}(\text{healthy} \mid \text{negative})}_{\approx 0.999989889} > \underbrace{p_{X|Y}(\text{infected} \mid \text{negative})}_{\approx 1-0.999989889=0.000010111}.$$

You have used 1 of 5 submissions

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