



MITx: 6.008.1x Computational Probability and Inference



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Introduction to Probability

Exercises due Sep 22, 2016 at 02:30 IST



Probability Spaces and Events

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Exercise: Events

(3/3 points)

- Consider the following probability space.

```
model = {'benign': 0.3, 'malignant': 0.5, 'not sure': 0.2}
```

- What is the probability of the event encoded by the Python set {'benign', 'malignant'}?

0.8



Answer: 0.8

How many events are there for this probability space? (Remember that the empty set is also an event since it is a subset of the sample space $\Omega = \{\text{benign, malignant, not sure}\}$!)

8



Answer: 8

In general, suppose that a probability space has m (not infinite) different possible outcomes, i.e., the sample space Ω has size $|\Omega| = m$. How many events are there, in terms of m ?

In this part, please provide your answer as a mathematical formula (and not as Python code). Use \wedge for exponentiation, e.g., x^2 denotes x^2 . Explicitly include multiplication using $*$, e.g. $x*y$ is xy .

2^m

 Answer: 2^m

2^m

Solution:

- What is the probability of the event encoded by the Python set {'benign', 'malignant'}?

We add the probabilities of 'benign' and 'malignant' to get $0.3 + 0.5 = \mathbf{0.8}$.

- How many events are there for this probability space? (Remember that the empty set is also an event since it is a subset of the sample space $\Omega = \{\mathbf{benign, malignant, not sure}\}$!)

There are 8 possible events: $\{\}, \{\text{benign}\}, \{\text{malignant}\}, \{\text{not sure}\}, \{\text{benign, malignant}\}, \{\text{benign, not sure}\}, \{\text{malignant, not sure}\}, \{\text{benign, malignant, not sure}\}$.

- In general, suppose that a probability space has m (not infinite) different possible outcomes, i.e., the sample space Ω has size $|\Omega| = m$. How many events are there, in terms of m ?

There are 2^m possibilities. To count the number of events, note that to form each event, we go through each of the m possible outcomes and we either include the outcome or not. Thus, the total number of possible events is:

2 (whether we include the first outcome or not) multiplied by
 2 (whether we include the second outcome or not) multiplied by
 ...
 finally multiplied by 2 (whether we include the m -th outcome or not)
 $= 2^m$.

You have used 1 of 5 submissions

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