MITx: 6.008.1x Computational Probability and Inference

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 $\Omega = \{\text{benign}, \text{malignant}, \text{not sure}\}$!)

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 ^ 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 = **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 $\Omega = \{\text{benign}, \text{malignant}, \text{not sure}\}$!)

  There are 8 possible events: {}, {benign}, {malignant}, {not sure}, {benign, malignant}, {benign, not sure}, {malignant, not sure}, {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