



Bookmarks



Bookmark

- ▶ Unit 0: Overview
- ▶ Entrance Survey
- ▶ Unit 1: Probability models and axioms
- ▼ Unit 2: Conditioning and independence

Unit overview

Lec. 2: Conditioning and Bayes' rule

Exercises 2 due Feb 17, 2016 at 23:59 UTC

Lec. 3: Independence

Exercises 3 due Feb 17, 2016 at 23:59 UTC

Solved problems

Problem Set 2

Problem Set 2 due Feb 17, 2016 at 23:59 UTC

Unit 2: Conditioning and independence > Lec. 2: Conditioning and Bayes' rule > Lec 2 Conditioning and Bayes rule vertical3

EXERCISE: TOTAL PROBABILITY THEOREM (2/2 points)

We have an infinite collection of biased coins, indexed by the positive integers. Coin i has probability 2^{-i} of being selected. A flip of coin i results in Heads with probability 3^{-i} . We select a coin and flip it. What is the probability that the result is Heads? The geometric sum formula may be useful here: $\sum_{i=1}^{\infty} \alpha^i = \frac{\alpha}{1-\alpha}$ when $|\alpha| < 1$.

The probability that the result is Heads is:

0.2



Answer: 0.2

Answer:

We think of the selection of coin i as scenario/event A_i . By the total probability theorem, for the case of infinitely many scenarios,

$$P(\text{Heads}) = \sum_{i=1}^{\infty} P(A_i)P(\text{Heads} \mid A_i) = \sum_{i=1}^{\infty} 2^{-i}3^{-i} = \sum_{i=1}^{\infty} (1/6)^i = \frac{1/6}{1 - (1/6)} = \frac{1/6}{5/6} = \frac{1}{5}$$

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