DSC 10, Spring 2018
Lecture 12

Chance and Sampling

sites.google.com/eng.ucsd.edu/dsc-10-spring-2018

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Random Selection

Random Selection

`np.random.choice`

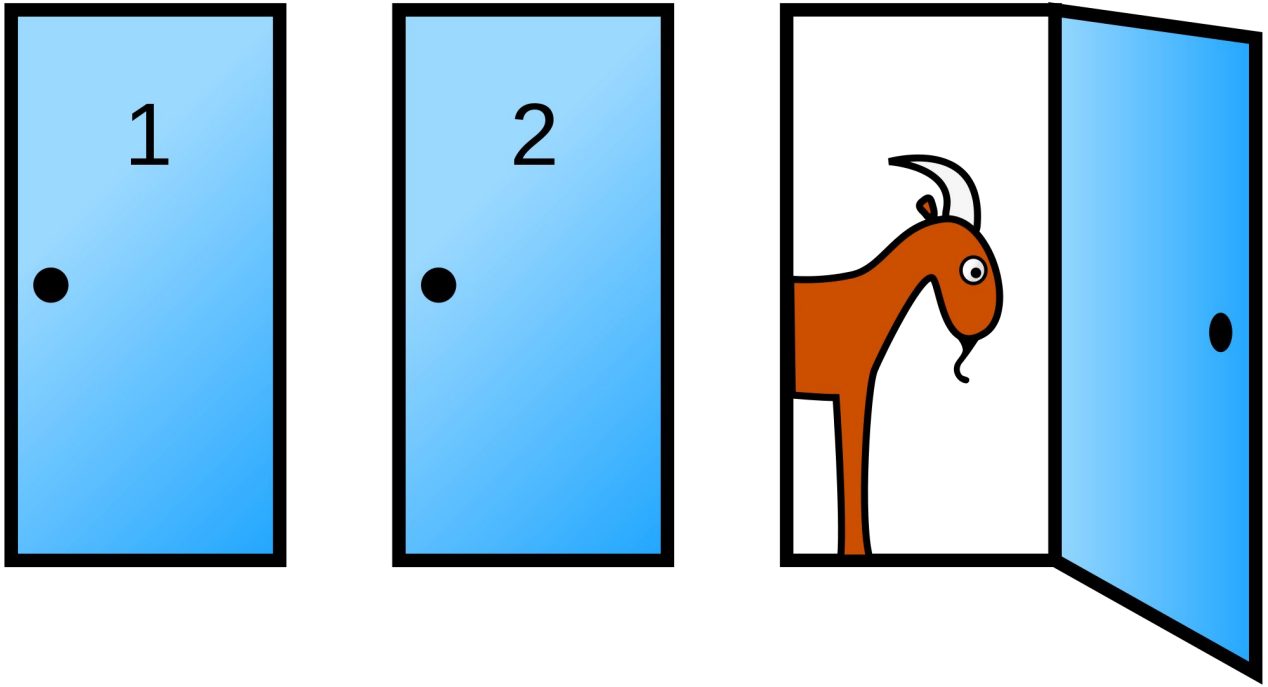
- Selects at random
- with replacement
- from an array
- a specified number of times

```
np.random.choice(some_array, sample_size)
```

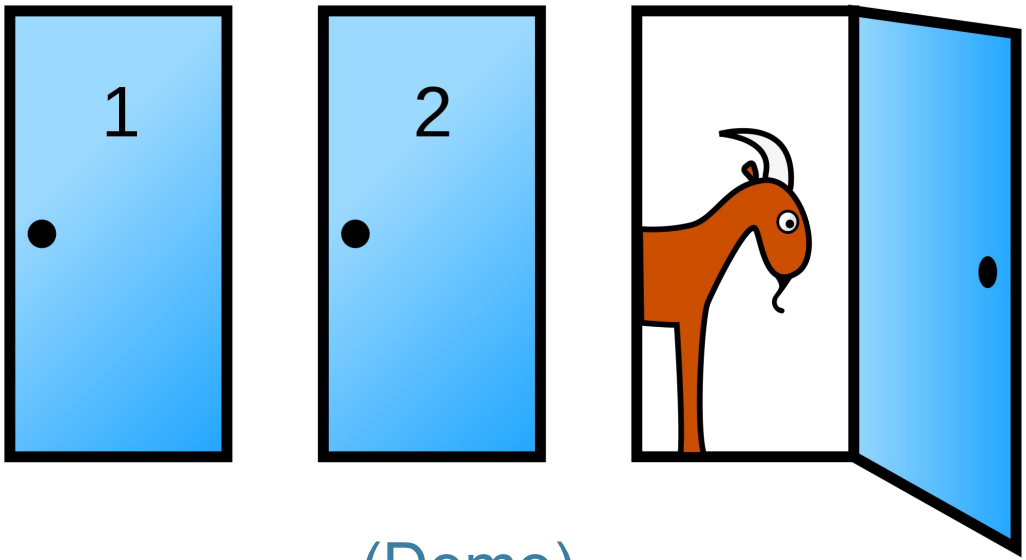
(Demo)

The Monty Hall Problem

Monty Hall Problem



Monty Hall Problem



(Demo)

What would you do?

Stay with the original choice or switch the doors?

A: Stay with door 1
B: Switch to door 2
C: Does not matter

Probability

Probability

- Event: *some* of the possible outcomes
- Lowest value: 0
  - Chance of event that is impossible
- Highest value: 1 (or 100%)
  - Chance of event that is certain

Equally Likely Outcomes

Assuming all outcomes are equally likely, the chance of an event A is:

$$P(A) = \frac{\text{number of outcomes that make A happen}}{\text{total number of outcomes}}$$

Discussion Question

I have three cards: red, blue and green.

What is the chance that I choose a card at random and it is green, then without putting it back, I choose another random card and it is red?

A. 1/9
B. 1/6
C. 1/3
D. 2/3
E. None of the above

Multiplication Rule

Chance that two events *A* and *B* both happen

= P(*A* happens) x P(*B* happens given that *A* has happened)

- The answer is *less than or equal to* each of the two chances being multiplied
- The more conditions you have to satisfy, the less likely you are to satisfy them all

Discussion Question

I have three cards: red, blue and green. I pick one card, then without putting it back, I pick a second card. What is the probability that I pick one red and one green?

A. 1/6
B. 1/3
C. 5/6
D. None of the above

Addition Rule

If event *A* can happen in ***exactly one*** of two ways, then

$$P(A) = P(\text{first way}) + P(\text{second way})$$

- The answer is *greater than or equal to* the chance of each individual way
- The more different ways an event can happen, the more likely it is to occur

Discussion: At Least One Head

I have a fair coin.

Find the probability of at least one head in 3 tosses.

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Find the probability of at least one head in 3 tosses.

- Any outcome *except* TTT
- P(TTT) = (½) x (½) x (½) = ⅛
- P(at least one head) = 1 - P(TTT) = ⅞ = 87.5%

Discussion Question

Every time I call my Grandma, the probability that she answers her phone is ⅓. If I call my Grandma **two** times today, what is the chance that I will talk to her?

A. 1/3
B. 2/3
C. 1/2
D. 1
E. None of the above

Discussion Question

Every time I call my Grandma, the probability that she answers her phone is ⅓. If I call my Grandma **three** times today, what is the chance that I will talk to her?

A. 1/3
B. 2/3
C. 1/2
D. 1
E. None of the above