# 2-7 Discrete Probability

Hengfeng Wei

hfwei@nju.edu.cn

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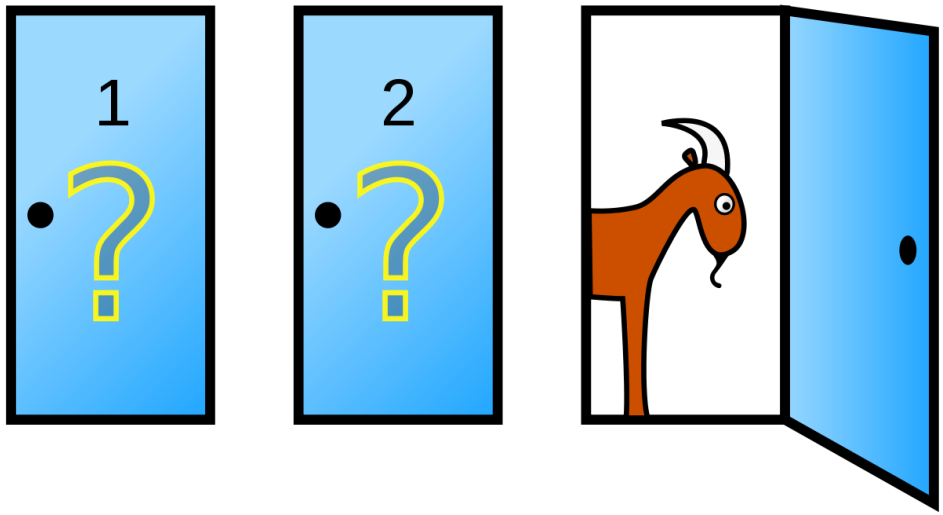
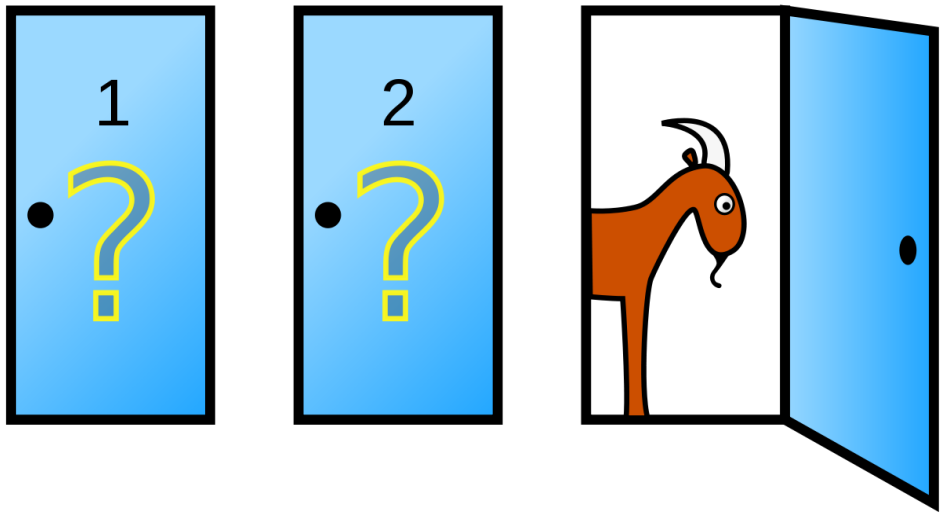
# The Monty-Hall Problem






You: Randomly pick a door (No. $1$)

I: Open a door which has a goat (No. $3$)

$Q$ : Do you want to switch to door No. $2$?

$C_i$ : The car is behind door $i$ $(i = 1, 2, 3)$

$$\boxed{\Pr\{C_i\} = \frac{1}{3}}$$

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$I_3$ : I open door No. $3$

$C_i$ : The car is behind door $i$ $(i = 1, 2, 3)$

$$\boxed{\Pr\{C_i\} = \frac{1}{3}}$$

$Y_1$ : you initially pick door 1

$$\boxed{\Pr\{X_1\} = \frac{1}{3}}$$

$I_3$ : I open door No. 3

$$\boxed{\Pr\{C_2 \mid I_3, Y_1\}}$$

$$\Pr\{C_2 \mid I_3, Y_1\} = \frac{\Pr\{C_2, I_3, Y_1\}}{\Pr\{I_3, Y_1\}} = \frac{\Pr\{I_3, Y_1 \mid C_2\} \Pr\{C_2\}}{\Pr\{I_3 \mid Y_1\} \Pr\{Y_1\}}$$
$$= \frac{\Pr\{I_3, Y_1 \mid C_2\}}{\Pr\{I_3 \mid Y_1\}}$$

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$$= \frac{\Pr\{I_3 \mid C_2, Y_1\} \Pr\{Y_1 \mid C_2\} \Pr\{C_2\}}{\Pr\{C_2\}}$$
$$= \frac{1}{3} \Pr\{I_3 \mid C_2, Y_1\}$$

$$\Pr\{C_2 \mid I_3, Y_1\} = \frac{\Pr\{I_3 \mid C_2, Y_1\}}{3 \Pr\{I_3 \mid Y_1\}}$$

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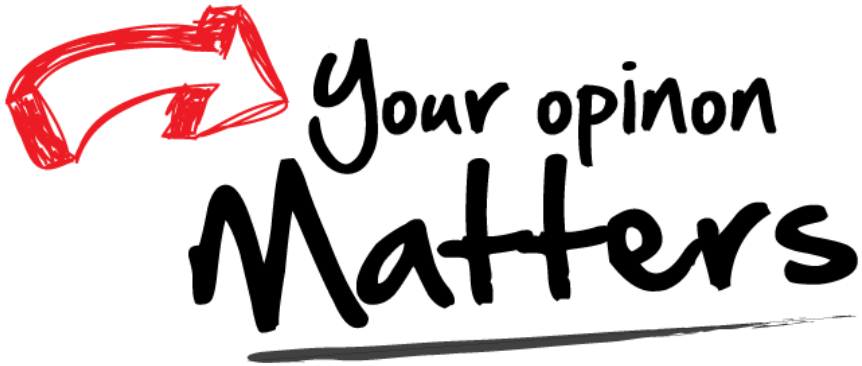
Thank
You!




Office 302

Mailbox: H016

hfwei@nju.edu.cn