

# ARTIFICIAL INTELLIGENCE METHODS

## Assignment 2

SINDRE LIAN THRONÆS      SINDRELT@STUD.NTNU.NO

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### 1 The Monty Hall Problem

1



Norwegian University of  
Science and Technology

Department of Computer Science  
Norwegian University of Science and Technology

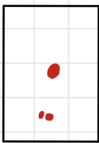
# 1 The Monty Hall Problem

Should I alter my choice?

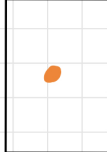
Yes, I should definitely alter my choice. Underneath follows a couple screenshots from geNIe in which I've did inference on whether to change door after the official has opened another door. I've also included a draft by hand where I did the calculations for the probability tables for the nodes (mostly for OpenedByOfficial since this table was the largest to complete).

29.07.23

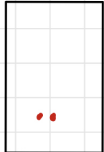
A



B



C



• : My 1st Pick

• : Official's Pick

•• : My 2nd Pick

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$P(\text{Prize}) = 0.333$      $P(\overline{\text{Prize}}) = 0.666$   
 $P(\text{OpenO} = A \mid \text{choice} = A) = 0$  ✗  
 $P(\text{OpenO} = B \mid \text{choice} = A) = 1/2$   
 $P(\text{OpenO} = C \mid \text{choice} = A) = 1/2$   
 $P(\text{OpenO} = A \mid \text{choice} = B) = 0$  Contains Prize  
 $P(\text{OpenO} = B \mid \text{choice} = B) = 0$  ✗  
 $P(\text{OpenO} = C \mid \text{choice} = B) = 1$   
 $P(\text{OpenO} = A \mid \text{choice} = C) = 0$  Contains Prize  
 $P(\text{OpenO} = B \mid \text{choice} = C) = 1$   
 $P(\text{OpenO} = C \mid \text{choice} = C) = 0$  ✗

$\Rightarrow P(\text{Prize} = A \mid \text{OpenO} = B, \text{choice} = A) = 1/3$   
 $P(\text{Prize} = C \mid \text{OpenO} = B, \text{choice} = A) = 2/3$

### Node properties: ContainsPrize

General Definition Format User properties



▶	DoorA	0.334
	DoorB	0.333
	DoorC	0.333

### Node properties: MyChoice

General Definition Format User properties



▶	DoorA	0.334
	DoorB	0.333
	DoorC	0.333

Node properties: OpenedByOfficial

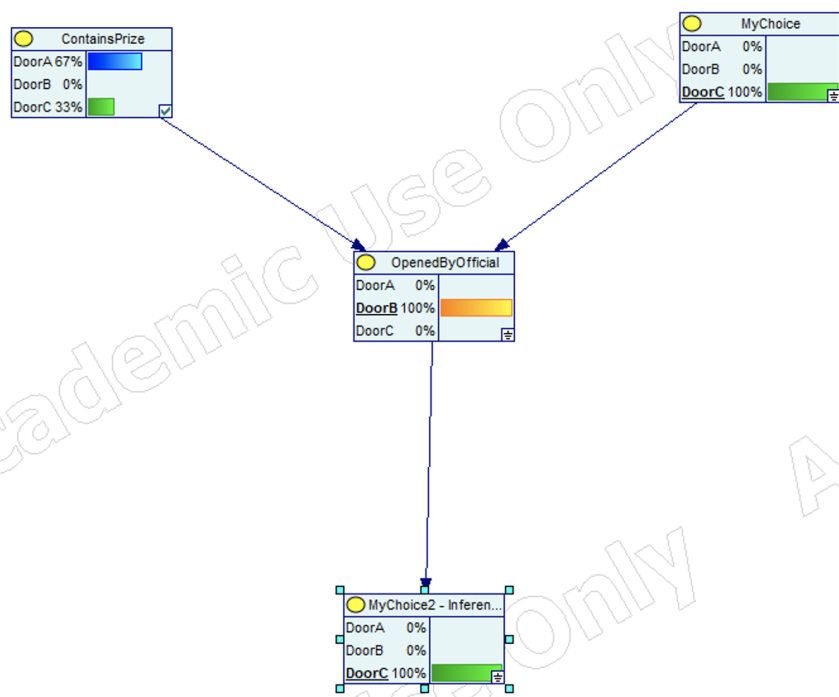
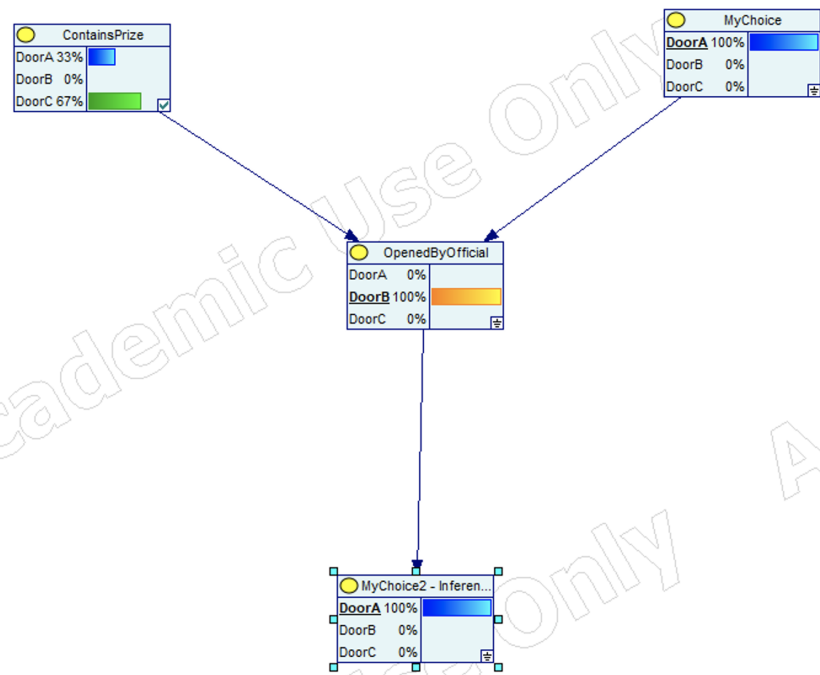
General Definition Format User properties

ContainsPrize	DoorA			DoorB			DoorC		
MyChoice	DoorA	DoorB	DoorC	DoorA	DoorB	DoorC	DoorA	DoorB	DoorC
DoorA	0	0	0	0	0.5	1	0	1	0.5
DoorB	0.5	0	1	0	0	0	1	0	0.5
DoorC	0.5	1	0	1	0.5	0	0	0	0

Node properties: MyChoice2 - Inference

General Definition Format User properties

OpenedByOfficial	DoorA	DoorB	DoorC
DoorA	0	0.5	0.5
DoorB	0.5	0	0.5
DoorC	0.5	0.5	0



As seen in the last two pictures above, the probability of choosing the door with the prize behind it increases if when choose to change our pick.

$$P(\textit{ContainsPrize} = A | \textit{OpenedByOfficial} = B, \textit{MyChoice} = A) = 1/3$$

$$P(\textit{ContainsPrize} = C | \textit{OpenedByOfficial} = B, \textit{MyChoice} = A) = 2/3$$

**Therefore I should alter my choice in the Monty Hall Problem**