

Exercise 8

Basics of Probabilistic Programs

Reliable and Interpretable Artificial Intelligence 2017
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Problem 1. In a far away pond, two fish swim. One of them is a piranha. There is a 0.5 probability that the other one is Nemo, or another piranha.

1. A fisherman takes out one of the fish from the pond. What is the probability that the fish is Nemo?
2. The fisherman observes this was a piranha. What is the probability that the other fish is Nemo?
3. Write a probabilistic program (over the simple probabilistic language defined in the lecture) that encodes subproblem 2.
4. Show the probabilistic semantics of the program.

(Optional) Problem 2. In the Monty Hall problem you are given three doors. Behind two of them there are goats. Behind the other door there is a fancy car. Monty Hall tells you to pick a door. You pick door 1. Monty Hall opens door 3, behind which you see a goat. Now, Monty tells you: “Would you like to switch to door 2?”

1. Determine whether you should keep door 1 or switch to door 2. What is the winning probability in each of the cases?
2. Write a probabilistic program (over the simple probabilistic language defined in the lecture) that encodes this problem.