4   Lost in the Magical Forest

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Project: EF1-10

Challenge

The elf Gilfi sets out to gather mushrooms in the magical forest for a Christmas feast. This magical forest not only has the best mushrooms far and wide but also a very special structure: at the forest's entrance, there are three paths. Each of the three paths leads to a different clearing. At each clearing, there are two new paths, again each leading to two new different clearings. If one continues onward, this pattern repeats: every clearing you reach opens up two new paths to other clearings. Gilfi excitedly runs into the magical forest, choosing a path at each clearing, with probability 1/3 for each path - either one of the two new paths or the path he arrived on. After gathering some mushrooms, he realizes he's lost in the magical forest! But in fact, he ends up in one of the three clearings that can be reached directly from the entrance via one of the three paths. What is the probability that he will eventually find his way back to the entrance from this point if he always chooses one of the three paths at a clearing at random?

Hint: One way to start is to consider the probability for any given clearing of moving towards the forest entrance or deeper into the forest.

Possible Answers:

1. 0

2. 1/10

3. 1/6

4. 1/4

5. 1/3

6. 1/2

7. 2/3

8. 3/4

9. 4/5

10. 1

Project Context

Many physical, biochemical, and social processes are described by stochastic particle-based models. This task can be interpreted as the random movement of a particle on a network.