Express Riddler

5 November 2021

Riddle:

As of today, The Riddler Social Network is being rebranded as μετα—that's mu epsilon tau alpha. Those Greek letters really augment the brand, don't you think?

A group of 101 people join μετα, and each person has a random, 50 percent chance of being friends with each of the other 100 people. Friendship is a symmetric relationship on μετα, so if you're friends with me, then I am also friends with you.

I pick a random person among the 101—let's suppose her name is Marcia. On average, how many friends would you expect each of Marcia's friends to have?

Solution:

I decided to tackle this problem via simulation. The code is located in `social_network.C`.

I started by creating a 101×101 array. This array was randomly filled with 0s or 1s; a 1 in the ath row and bth column means that a and b are friends. For completeness, and to save computing power, I only had to randomly determine the top half of the array where $a > b$; the bottom half was then simply mirrored. Additionally, the diagonal (where $a = b$) was filled only with 0s.

Once the array was filled, I read off the friend list from the first column, then counted the total number of 1s from each of the 1 columns in that list. Then the friends' friend count was averaged.

After several thousand simulations, the results showed that Marcia has about 50 friends on average, while her friends have about **50.5**. So on average, Marcia's friends have about 0.5 more friends than her.