Stanford University Mathematical Organization(SUMO) Speaker Series

Wednesday, November 19

6:00-7:20 P.M., Arrillaga Study Room (First Floor of Arrillaga Dinning Hall)

Combinatorial Group Testing

Professor Mary Wootters

1   Abstract

Consider the following puzzle: a king has n bottles of wine, but he knows that one of them might be poisoned! He wants to hold a party tomorrow, and certainly doesn't want to serve poisoned wine to his guests. The court alchemist can perform a test to see whether or not a sample of wine contains any poison in it...but each test requires an ounce of gold. Also, the tests take 24 hours to complete, so the king has to decide on all the tests up front in order to get them done in time for the party. How much gold does the king need to spend to guarantee the safety of his guests? (Hint: you can make a sample by mixing wine from different bottles). If you can figure out the answer to that puzzle, now suppose that there are k poisoned bottles of wine, instead of just one. How much gold does the king need now? This problem is known as "combinatorial group testing" and is relevant not just for party planning, but also has applications in computational biology, algorithm design, and networking, to name a few. In this talk, we'll introduce the basics of this problem, talk about some applications, and see some solutions!