Homework of Week 10

Deadline: 9:00am, December 2 (Thursday), 2021

1. Prove that for any integer n, there exists a coloring of the edges of the complete graph K_n by two colors so that the total number of monochromatic copies of K_4 is at most $\binom{n}{4}2^{-5}$.

2. Design a randomized algorithm to find a 2-coloring of K_n which contains at most $\binom{n}{4}2^{-5}$ monochromatic copies of K_4. Analyze the average time complexity of the algorithm, which is required to be polynomial in n.

3. Do Bernoulli experiment for 20 trials, using a new 1-Yuan coin. Record the result in a string $s_1 s_2 ... s_i ... s_{20}$, where s_i is 1 if the ith trial gets Head, and otherwise is 0.