

Discussion 4C

CS 70, Summer 2024

1 Student Body

In a group of 100 students, 50 are computer science majors, 40 are data science majors, and 10 are both computer science and data science majors. Further suppose that 20 of the computer science majors are intending to become software engineers, while 10 of data science majors are intending to become software engineers.

A student is selected uniformly at random from this group of students.

(a) Consider the following events.

- C : the selected student is a computer science major.
- D : the selected student is a data science major.
- S : the selected student intends to become a software engineer.

Draw the outcome space Ω and the events C , D , and S .

(b) Find the chance that the selected student is a computer science major.

(c) Find the chance that the selected student is both a computer science major and a data science major.

(d) Find the chance that the selected student is either a computer science major or data science major.

(e) Find the chance that the selected student is a computer science major but not a data science major.

(f) If you can, find the chance that the selected student intends to become a software engineer. Otherwise, provide the best bounds you can.

(g) If you can, find the chance that the selected student is a computer science major, not a data science major, and intends on becoming a software engineer. Otherwise, provide the best bounds you can.

2 Office Hours

A class has n staff members and m slots for office hours. Each staff member chooses an office hour slot uniformly at random, regardless of the choices of the other staff members.

(a) Find the chance that all the staff members choose the same slot.

(b) Find the chance that the first office hours slot ends up with no staff members.

(c) Find the chance that at least one staff member has office hours during the first slot.

3 Homework Submission

In a class of n students, suppose that all of the students submit their homework in the six hours before the midnight due date. In particular, suppose that each student submits their homework uniformly at random in each of the intervals 6 pm – 7 pm, 7 pm – 8 pm, 8 pm – 9 pm, 9 pm – 10 pm, 10 pm – 11 pm, 11 pm – 12 am, regardless of when the other students submit their homeworks.

(a) Find the probability that none of the students submit their homework after 10 pm.

(b) Find the probability that none of the students submit their homework after 11 pm.

(c) Find the probability that the last homework submission happens in the 10 pm - 11 pm interval.