
DSC 40B - Discussion 02

Problem 1.

- a) Let $f(n) = 12\log_2(3^{n^2-2n} + 2^{\log n} - 10n^2 - \log_3 n)$. Which of the following asymptotic bounds on f is true?
- b) What is the best case time complexity of the following function?

```
def foo(arr):
    ''' arr is a sorted array of size n'''
    i = 0
    j = len(arr) - 1

    while i < j:
        current_sum = arr[i] + arr[j]

        if current_sum == 5:
            return sum(arr)
        elif current_sum < 5:
            i += 1
        else:
            j -= 1

    return False
```

Problem 2.

$$f(n) = \frac{n^2 + 2n - 5}{n - 10}$$

Problem 3.

Consider the algorithm below.

```
def bogosearch(numbers, target):
    """search by randomly guessing. `numbers` is an array of n numbers"""
    n = len(numbers)

    while True:
        # randomly choose a number between 0 and n-1 in constant time
        guess = np.random.randint(n)
        if numbers[guess] == target:
            return guess
```

We will set up the analysis of the expected time complexity of this algorithm.

- a) What are the cases? How many are there?
- b) What is the probability of case α ?
- c) What is the running time in case α ?

Problem 4.

Provide a tight theoretical lower bound for the problems given below. Provide justification for your answer.

- a) Given an array of n numbers, find the sum of the numbers in the array.
- b) Given a sorted array of $n \geq 2$ numbers, find the second largest number in the array.