

## CSCI 570 Fall 2016 Discussion 2

1. Suppose we have an array  $A$  of  $n$  integers and we wish to compute an  $n \times n$  array  $B$  where  $B[i,j]$  holds the sum of  $A[i]$  through  $A[j]$ . The following code fragment is one way to solve this problem:

```
for i = 1 to n
  for j = i to n
    sum = 0;
    for k = i to j
      sum += A[k];
    B[i, j] = sum;
```

- What is the running time of the code fragment?
- Do you think this *problem* can be solved in time better than  $O(n^2)$ ? Why or why not?
- Give an  $O(n^2)$  time solution to this problem.

2. Mathematicians often keep track of a statistic called their Erdős Number, after the great 20th century mathematician. Paul Erdős himself has a number of zero. Anyone who wrote a mathematical paper with him has a number of one, anyone who wrote a paper with someone who wrote a paper with him has a number of two, and so forth and so on. Supposing that we have a database of all mathematical papers ever written along with their authors:

- Explain how to represent this data as a graph.
- Explain how we would compute the Erdős number for a particular researcher.
- Explain how we would determine all researchers with Erdős number at most two.

3. In class, we discussed finding the shortest path between two vertices in a graph. Suppose instead we are interested in finding the *longest* simple path in a directed acyclic graph. In particular, I am interested in finding a path (if there is one) that visits all vertices. Given a DAG, give a linear-time algorithm to determine if there is a simple path that visits all vertices.