

## CS 161 Fall 2017: Section 8

### Fair Division

You have a cake sliced into  $n$  differently sized pieces. You need to split it among  $k$  students in your class where  $k \leq n$  and you want to give each student exactly 1 piece of cake. However, you know that since the pieces are differently sized, the students who end up with smaller pieces will most likely complain about *unfairness*. You want to minimize the complaints by minimizing *unfairness*. If you select  $k$  cake pieces of size  $S_1, \dots, S_k$  then unfairness is defined as  $\max(S_1, \dots, S_k) - \min(S_1, \dots, S_k)$ .

- (a) Describe a very simple algorithm to maximize unfairness.
- (b) Describe an algorithm to minimize unfairness.

### Restricted MST

Given an undirected weighted graph  $G = (V, E)$ , we have a set  $U \subset V$ . We wish to find a minimum spanning tree such that all nodes in  $U$  are leaf nodes. (The result may not be a MST of the original graph  $G$ .)

### Pareto Points

Given a set of 2d points  $P$ , a Pareto optimal point is a point  $(x, y)$  such that  $x > x'$  or  $y > y'$ ,  $\forall (x', y') \neq (x, y) \in P$ . Develop an algorithm to find all Pareto optimal points.