

## Tutorial 08: July 10

**1. Interpolation Search**

Suppose we have an array  $\mathcal{A}$  of numbers such that  $\mathcal{A}[i] = ai + b$  with  $a > 0$  and  $b$  as real numbers. Show that interpolation search always achieves a runtime of  $O(1)$  with  $\mathcal{A}$ , regardless of whether the target is in the array or not.

**2. MTF/Transpose**

Consider a linked list with the keys  $k_1, k_2, \dots, k_n$  in that order. Give a sequence of  $n$  searches such that the Move-To-Front Heuristic uses  $O(n)$  comparisons while the Transpose Heuristic uses  $\Omega(n^2)$  comparisons.

**3. Who carries coin these days**

Consider a skip list in which we build new towers with probability  $1/4$ . When adding an element to the skip list, we flip two coins at the same time, until we see at least one tail. The number of times we toss both coins and obtain two heads is the height of the tower. Using the probability for tower heights described in the above quote, direct the expected height of any tower.