

In this note we explore the problem of the average value of the length of the longest increasing subsequence in a randomly generated sequence of a given length.

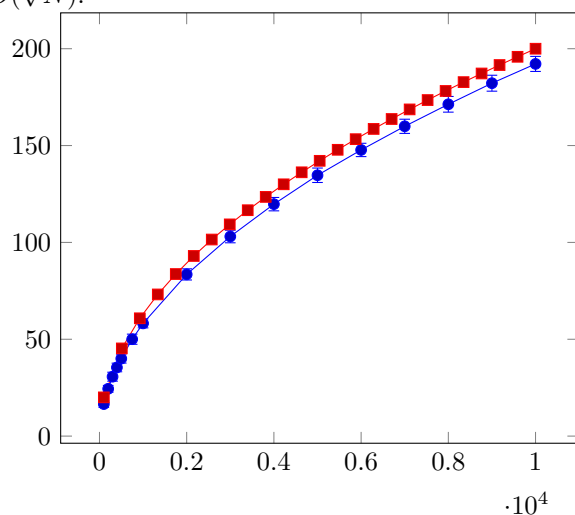
## 1 Problem statement

The *longest increasing subsequence* of a given sequence is a subsequence - i.e. elements are chosen in the same order as they appear in the given sequence - that is sorted. The problem is to find the longest among such subsequences.

An interesting question is – given a randomly generated sequence what is the average length of longest increasing subsequence.

## 2 Experiment setup

To generate a sequence of length  $N$  each element is independently generated using uniform distribution of integers in the range  $[0, 10 \times N]$ . For each  $N$  we performed 200 experiments. The blue graph below shows the average value of the longest increasing subsequence plus-minus standard deviation. The red graph shows function  $2\sqrt{x}$  which grows almost at the same rate, supporting the hypothesis that average length of the longest increasing subsequence of size  $N$  is  $O(\sqrt{N})$ .



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