

Algorithms and Data Structures

Summer Semester 2022

For discussion on Tuesday, May 10, 2022

1. Reconsider the two algorithms for computing prefix averages which we discussed on May 3 (see GTG, Section 3.3.3), one that computes the prefix average in $O(n^2)$ time, the other which finishes in $O(n)$ time.

Modify your Python code such that, in one plot, you show

- (a) the recorded timings of the $O(n^2)$ algorithm,
- (b) the recorded timings of the $O(n)$ algorithm,
- (c) a reference line $f(n) = \text{const} \cdot n^2$,
- (d) a reference line $f(n) = \text{const} \cdot n$.

Hints:

- If you did not manage to complete a working version of both algorithms during the tutorial session on Tuesday, you can find a working version on the class web site, named `2022-05-03_prefix_averages.py`. This file also contains an alternative implementation of the $O(n^2)$ algorithm—you should be able to easily see which is which.
- To plot several data sets into one plot, just issue separate calls to `loglog` without calling `figure()` again.
- It is good practice to draw a legend. Example:

```
legend(('first data set', 'second data set', ...))
```

2. See the attached excerpt from GTG, p. 143. For each of the five algorithms, state the expected running time in big-Oh notation.