



Challenge 1

ADVANCED ALGORITHMS AND PARALLEL PROGRAMMING

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- ❑ Groups up to 3 people
 - Changing team for the 2nd challenge is ok
- ❑ One week of time
- ❑ **3 points for free** in the 1st part of the exam
 - Skip selected questions
 - Valid any time in the whole academic year

- ❑ Material to be delivered on Webeep:
 - Copy of the Colab with code .pynb (no link)
 - Submitting a file other than .pynb is possible, but it requires prior discussion with me
 - Use comments
 - 24h grace period for configuration errors
 - Short PDF report (**max 2 pages**)
 - Experimental setup
 - Performance measurements
 - Explanation of design choices
 - No screenshots of the code!
- ❑ Deadline: **22nd October, midnight**

- Implement the deterministic algorithm for the Select-ith problem (see slide [link](#) slide 26)

- 26 - Worst-case linear-time order statistics

SELECT(i, n)

1. Divide the n elements into groups of 5. Find the median of each 5-element group by rote.
2. Recursively SELECT the median x of the $\lfloor n/5 \rfloor$ group medians to be the pivot.
3. Partition around the pivot x . Let $k = \text{rank}(x)$.
4. if $i = k$ then return x
elseif $i < k$
 then recursively SELECT the i th smallest element in the lower part
 else recursively SELECT the $(i-k)$ th smallest element in the upper part

} Same as RAND-SELECT

Resources

Colab notebook on Karger-MinCut: [link](#)

Examples with Google Benchmark library [link](#)

□ Goals:

- Display the asymptotic complexity using the Google benchmark library
- Provide sufficient tests to validate the implementation
- Compare with the randomized version and demonstrate its functionality with the tests used