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HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

ONE LOVE. ONE FUTURE.



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Applied Algorithm Lab

Max-distance Sub-sequence

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Max-distance sub-sequence

- Given a sequence a_1, \dots, a_N
- Consider a subset of the sequence

The distance of the subset is defined to be the minimum distance between two elements

- Find the subset of N given elements containing exactly C elements such that the distance is maximal.
- Example

stdin	stdout
1 5 3 1 2 8 4 9	3

Max-distance sub-sequence

- Idea to solve: Sort a_1, \dots, a_N in increasing order
- The max-distance must be $\leq \frac{a_N - a_1}{c - 1}$
- Find max-distance: traverse from $d = \frac{a_N - a_1}{c - 1}$ down to 1:
 - check(d): Check if we can find a sub-sequence with distance $\geq d$: Greedy
 - Add a_1 into subsequence, use an auxiliary variable **last**
 - for $i=2, i \leq n; i++$:
 - if $a[i] - \text{last} \geq d$ then we add $a[i]$ to the subsequence and update **last**
 - otherwise continue
 - If the subsequence has C elements then d is max-distance. Print d
 - Complexity: $O(n^2)$

- Idea to solve: Sort a_1, \dots, a_N in increasing order
- The max-distance must be $\leq \frac{a_N - a_1}{c - 1}$
- Find max-distance from $d = \frac{a_N - a_1}{c - 1}$ down to 1: this can be improved
 - Binary search for d
 - Complexity: $O(n \log n)$

A large graphic on the left side of the slide. It features a dark blue background with a circular pattern of red dots of varying sizes, creating a sense of depth and movement. The word "HUST" is centered within this graphic in a bold, white, sans-serif font.

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THANK YOU !