CS35X: Competitive Programming

Lecture 9: Prefix Sums

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Quiz 2

Sample Problem: Range Sums

- Input: array **A** of up to 100000 integers
  - **A = [-2 15 -14 50 -5 1]**
- Goal: compute maximal value of a subarray A[I…j]: **A[i] + … + A[j]**

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- Brute Force:
  - for each (i,j), compute **A[i]+…+A[j],** return maximal sum
  - **O(n^3)** time

Prefix Sums

- Given an array A, the prefix sum of A is defined such that
  - pre[I] is the sum of the first I elements of A.

```
pre[0]=0;
for i = 1…N:
  pre[i] = pre[i-1]+A[i-1];
```

- We can use prefix sums to compute range sums:

```
lo_pref_sum=0;
hi_rangesum=0;
for i =1..N:
  hi_rangesum = max(hi_rangesum, pre[I]-lo_pref_sum)
  lo_pref_sum = min(lo_pref_sum, pre[i])
```

Kattis Problem: Commercials