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CS 577 - Homework 3

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1 Graded written problem

Input: A sequence of n real numbers a_1, a_2,..., a_n and a corresponding sequence of weights w_1, w_2, . . . , w_n. The weights are nonnegative reals that add up to 1, i.e. $\sum_n^{i=1} w_i = 1$.

Output: The weighted median of the sequence is the number a_k such that $\sum_{a_i<a_k} w_i$<1/2 and $\sum_{a_i<=a_k} w_i \geq 1/2$

Algorithm 1 Algorithm to find weighted median

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1: procedure WEIGHTED-MEDIAN(A_w^a)
2:     Median =← SELECTION(A_w^a, ⌈n/2⌉)        ▷ The Selection will happen over A
3:     Pivot ← Median
4:     L_w^a, R_w^r ← PARTITION(A_w^a, Pivot)
5:     if Σ w_L <1/2 then
6:         w_Pivot ← Σ w_L + w_Pivot
7:         if w_Pivot ≥ 1/2 then
8:             return Pivot
9:         WEIGHTED-MEDIAN(Pivot|R_w^a)
10:    else
11:        WEIGHTED-MEDIAN(L_w^a)
```