## Binary Heaps: Homework 2

## 24/3/2020

1. By modifying the code written during the last lessons, provide an array-based implementation of binary heaps which avoids to swap the elements in the array A.

(*Hint*: use two arrays, key\_pos and rev\_pos, of natural numbers reporting the position of the key of a node and the node corresponding to a given position, respectively)

2. Consider the next algorithm:

```
def Ex2(A)
  D ← build(A)

while ¬ is_empty(D)
          extract_min(D)
  endwhile
enddef
```

where A is an array. Compute the time-complexity of the algorithm when:

- build, is\_empty  $\in \Theta(1)$ , extract\_min  $\in \Theta(|D|)$ ;
- build $\in \Theta(|A|)$ , is\_empty $\in \Theta(1)$ , extract\_min $\in O(\log n)$ ;