mergesort

May 26, 2021

[1]:
```
def merge(array, left_index, right_index, middle):
    # Make copies of both arrays we're trying to merge

    # The second parameter is non-inclusive, so we have to increase by 1
    left_copy = array[left_index:middle + 1]
    right_copy = array[middle+1:right_index+1]

    # Initial values for variables that we use to keep
    # track of where we are in each array
    left_copy_index = 0
    right_copy_index = 0
    sorted_index = left_index

    # Go through both copies until we run out of elements in one
    while left_copy_index < len(left_copy) and right_copy_index <␣
↪len(right_copy):

        # If our left_copy has the smaller element, put it in the sorted
        # part and then move forward in left_copy (by increasing the pointer)
        if left_copy[left_copy_index] <= right_copy[right_copy_index]:
            array[sorted_index] = left_copy[left_copy_index]
            left_copy_index = left_copy_index + 1
        # Opposite from above
        else:
            array[sorted_index] = right_copy[right_copy_index]
            right_copy_index = right_copy_index + 1

        # Regardless of where we got our element from
        # move forward in the sorted part
        sorted_index = sorted_index + 1

    # We ran out of elements either in left_copy or right_copy
    # so we will go through the remaining elements and add them
    while left_copy_index < len(left_copy):
        array[sorted_index] = left_copy[left_copy_index]
        left_copy_index = left_copy_index + 1
        sorted_index = sorted_index + 1
```

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    while right_copy_index < len(right_copy):
        array[sorted_index] = right_copy[right_copy_index]
        right_copy_index = right_copy_index + 1
        sorted_index = sorted_index + 1
```

[2]:
```
def merge_sort(array, left_index, right_index):
    if left_index >= right_index:
        return

    middle = (left_index + right_index)//2
    merge_sort(array, left_index, middle)
    merge_sort(array, middle + 1, right_index)
    merge(array, left_index, right_index, middle)
```

[3]:
```
array = [33, 42, 9, 37, 8, 47, 5, 29, 49, 31, 4, 48, 16, 22, 26]
merge_sort(array, 0, len(array) -1)
print(array)
```

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[4, 5, 8, 9, 16, 22, 26, 29, 31, 33, 37, 42, 47, 48, 49]
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[ ]:
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