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Homework 2 Maximum Subarray Problem

Psuedocode

int[] func findMaxSubArr(int[] arr){

```
    int hi = -999999;
    int length = arr.length;
    int[] endpts = [];
    for(int start = 0; start < length; i++){
        int total = 0;
        for(int index = start; index < length; index++){
            total += arr[index]
            if(total > max){
                hi = total
                endpts = [start, index]
            }
        }
    }

    return endpts

}
```

Python Code

In [74]:

```
def findMaxSubArr(arr):
    # initial results
    hi = -999999
    endpts = ()

    ## Go through each index as a starting point - O(N)
    for start in range(len(arr)):
        total = 0
        ## Calculate the running sum from each start index to the end - O(N)
        for idx in range(start, len(arr)):
            total += arr[idx]
            ## if running total from start to current index is greater than hi
            ## then update hi and endpoints tuple - O(1)
            if total > hi:
                hi = total
                endpts = (start, idx)

# function is O(N^2)
# return original array, endpoints of max sub array, as well as sum of max sub array
return arr, endpts, hi
```

Tests for Python Code/Results

In [75]:
```
import random
tests = []
for _ in range(10):
    tests.append([ random.randrange(-999, 1000)for i in range(0,10)])
for i,test in enumerate(tests):
    print("Test " + str(i+1) + ":")
    print("")
    result = findMaxSubArr(test)
    print("Original Array :", result[0])
    print("Max Interval   :", result[1])
    print("Interval Sum   :", result[2])
    print("-----------------------------------------------------------------------------------------")
    print("")
```

```
Test 1:

Original Array : [-122, -329, -974, 758, -926, 775, -191, 836, -971, 25]
Max Interval   : (5, 7)
Interval Sum   : 1420
-----------------------------------------------------------------------------------------

Test 2:

Original Array : [-645, 657, -297, 990, -256, 160, 355, 929, -140, 559]
Max Interval   : (1, 9)
Interval Sum   : 2957
-----------------------------------------------------------------------------------------

Test 3:

Original Array : [-327, 29, -292, -318, -675, -522, -465, 122, -121, -352]
Max Interval   : (7, 7)
Interval Sum   : 122
-----------------------------------------------------------------------------------------

Test 4:

Original Array : [-236, -2, 61, -223, 775, -957, -578, 823, -364, -27]
Max Interval   : (7, 7)
Interval Sum   : 823
-----------------------------------------------------------------------------------------

Test 5:

Original Array : [-777, -244, -157, 936, -844, 680, -576, 441, -258, -327]
Max Interval   : (3, 3)
Interval Sum   : 936
-----------------------------------------------------------------------------------------

Test 6:

Original Array : [-325, 343, -171, -727, 519, 900, -461, 157, -704, -99]
Max Interval   : (4, 5)
Interval Sum   : 1419
-----------------------------------------------------------------------------------------

Test 7:

Original Array : [25, 470, 108, 884, -648, 903, 132, -646, -198, 773]
Max Interval   : (0, 6)
Interval Sum   : 1874
-----------------------------------------------------------------------------------------

Test 8:

Original Array : [-210, -707, -806, -569, 456, -150, 894, -555, -677, -704]
Max Interval   : (4, 6)
Interval Sum   : 1200
-----------------------------------------------------------------------------------------

Test 9:

Original Array : [-397, -806, 957, -896, 516, 153, 309, -113, 52, 123]
Max Interval   : (2, 9)
Interval Sum   : 1101
-----------------------------------------------------------------------------------------

Test 10:

Original Array : [-909, 669, -731, -179, 979, 352, -853, 514, -536, -979]
Max Interval   : (4, 5)
Interval Sum   : 1331
-----------------------------------------------------------------------------------------
```