一、執行結果:

給定指定數列 [33, 67, 8, 13, 54, 119, 3, 84, 25, 42]

輸出排序數列 [3, 8, 13, 25, 33, 42, 54, 67, 84, 119]

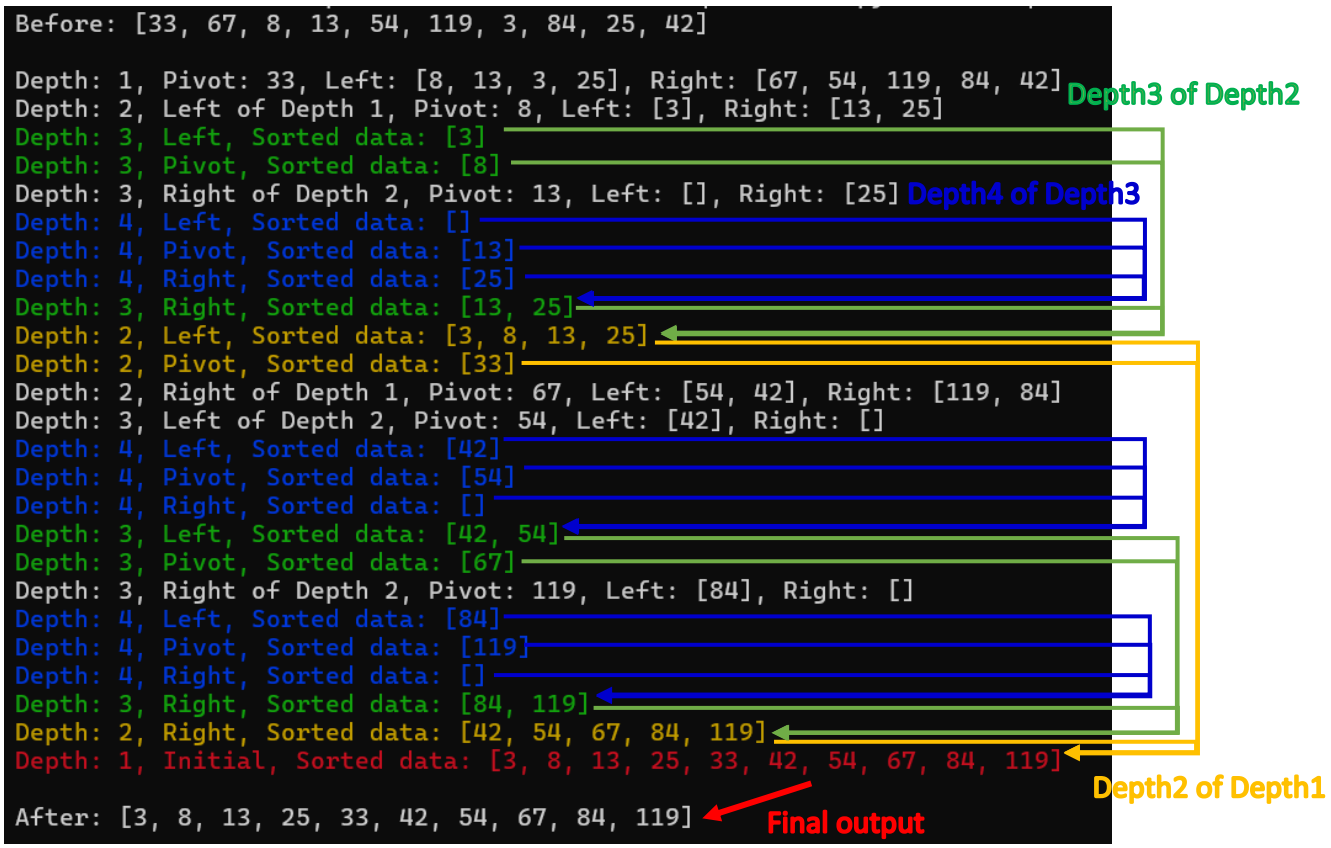
```
Before: [33, 67, 8, 13, 54, 119, 3, 84, 25, 42]

Depth: 1, Pivot: 33, Left: [8, 13, 3, 25], Right: [67, 54, 119, 84, 42]
Depth: 2, Left of Depth 1, Pivot: 8, Left: [3], Right: [13, 25]
Depth: 3, Left, Sorted data: [3]
Depth: 3, Pivot, Sorted data: [8]
Depth: 3, Right of Depth 2, Pivot: 13, Left: [], Right: [25]
Depth: 4, Left, Sorted data: []
Depth: 4, Pivot, Sorted data: [13]
Depth: 4, Right, Sorted data: [25]
Depth: 3, Right, Sorted data: [13, 25]
Depth: 2, Left, Sorted data: [3, 8, 13, 25]
Depth: 2, Pivot, Sorted data: [33]
Depth: 2, Right of Depth 1, Pivot: 67, Left: [54, 42], Right: [119, 84]
Depth: 3, Left of Depth 2, Pivot: 54, Left: [42], Right: []
Depth: 4, Left, Sorted data: [42]
Depth: 4, Pivot, Sorted data: [54]
Depth: 4, Right, Sorted data: []
Depth: 3, Left, Sorted data: [42, 54]
Depth: 3, Pivot, Sorted data: [67]
Depth: 3, Right of Depth 2, Pivot: 119, Left: [84], Right: []
Depth: 4, Left, Sorted data: [84]
Depth: 4, Pivot, Sorted data: [119]
Depth: 4, Right, Sorted data: []
Depth: 3, Right, Sorted data: [84, 119]
Depth: 2, Right, Sorted data: [42, 54, 67, 84, 119]
Depth: 1, Initial, Sorted data: [3, 8, 13, 25, 33, 42, 54, 67, 84, 119]

After: [3, 8, 13, 25, 33, 42, 54, 67, 84, 119]
```

二、運作概念:

根據顏色代表遞迴的深度，最深為藍色，其次為綠色，再來為黃色，最後為紅色。並且藉由一層一層的遞迴來計算並決定每一層深度的樞紐、左邊(小於樞紐的值)、右邊(大於樞紐的值)分別為何，最終將其整合成為新的排序數列。



三、程式碼

```
from termcolor import colored
color_set = ["red", "yellow", "green", "blue"]

def quicksort(data_set,depth=1,direct=None):
    color = color_set[depth-1]

    if len(data_set) <= 1:
        result = data_set
        print(colored(f"Depth: {depth}, {direct if direct else 'Initial'},
Sorted data: {result}" ,color))
        return data_set

    pivot = data_set[0]
    left = []
    middle = []
    right = []

    for x in data_set:
```

```
        if x < pivot:
            left.append(x)
        elif x == pivot:
            middle.append(x)
        else:
            right.append(x)

    if direct == None:
        print(f"Depth: {depth}, Pivot: {pivot}, Left: {left}, Right:
{right}")
    else:
        print(f"Depth: {depth}, {direct} of Depth {depth-1}, Pivot:
{pivot}, Left: {left}, Right: {right}")
    result = quicksort(left,depth+1,"Left") +
quicksort(middle,depth+1,"Pivot") + quicksort(right,depth+1,"Right")

    print(colored(f"Depth: {depth}, {direct if direct else 'Initial'},
Sorted data: {result}" ,color))
    return result

data_set = [33, 67, 8, 13, 54, 119, 3, 84, 25, 42]
print(f"Before: {data_set}\n")

sorted_data_set = quicksort(data_set)
print(f"\nAfter: {sorted_data_set}")
```

四、github 專案網址

https://github.com/Yen-Ling-127/hw3_quick_sort.git