

Solution 1

Solution 2

Solution 3

```
1 // Copyright © 2020 AlgoExpert, LLC. All rights reserved.
2
3 using System.Collections.Generic;
4
5 public class Program {
6     // Average case: when the created BST is balanced
7     // O(nlog(n)) time | O(n) space - where n is the length of the array
8     // ---
9     // Worst case: when the the created BST is like a linked list
10    // O(n^2) time | O(n) space
11    public static List<int> RightSmallerThan(List<int> array) {
12        if (array.Count == 0) return new List<int>();
13
14        List<int> rightSmallerCounts = new List<int>(array);
15        int lastIdx = array.Count - 1;
16        SpecialBST bst = new SpecialBST(array[lastIdx]);
17        rightSmallerCounts[lastIdx] = 0;
18        for (int i = array.Count - 2; i >= 0; i--) {
19            bst.insert(array[i], i, rightSmallerCounts);
20        }
21        return rightSmallerCounts;
22    }
23
24    public class SpecialBST {
25        public int value;
26        public int leftSubtreeSize;
27        public SpecialBST left;
28        public SpecialBST right;
29
30        public SpecialBST(int value) {
31            this.value = value;
32            leftSubtreeSize = 0;
33            left = null;
34            right = null;
35        }
36
37        public void insert(int value, int idx, List<int> rightSmallerCounts) {
38            insertHelper(value, idx, rightSmallerCounts, 0);
39        }
40
41        public void insertHelper(int value, int idx, List<int> rightSmallerCounts,
42            int numSmallerAtInsertTime) {
43            if (value < this.value) {
44                leftSubtreeSize++;
45                if (left == null) {
46                    left = new SpecialBST(value);
47                    rightSmallerCounts[idx] = numSmallerAtInsertTime;
48                } else {
49                    left.insertHelper(value, idx, rightSmallerCounts,
50                        numSmallerAtInsertTime);
51                }
52            } else {
53                numSmallerAtInsertTime += leftSubtreeSize;
54                if (value > this.value)
55                    numSmallerAtInsertTime++;
56                if (right == null) {
57                    right = new SpecialBST(value);
58                    rightSmallerCounts[idx] = numSmallerAtInsertTime;
59                } else {
60                    right.insertHelper(value, idx, rightSmallerCounts,
61                        numSmallerAtInsertTime);
62                }
63            }
64        }
65    }
66 }
67
```

