

Solution 1

```
1 // Copyright © 2020 AlgoExpert, LLC. All rights reserved.
2
3 package main
4
5 import (
6     "sort"
7 )
8
9 type Chain struct {
10     NextString string
11     MaxChainLength int
12 }
13
14 // O(n * m^2 + nlog(n)) time | O(nm) space - where n is the number of strings and
15 // m is the length of the longest string
16 func LongestStringChain(strings []string) []string {
17     // For every string, imagine the longest string chain that starts with it.
18     // Set up every string to point to the next string in its respective longest
19     // string chain. Also keep track of the lengths of these longest string chains.
20     stringChains := map[string]*Chain{}
21     for _, str := range strings {
22         stringChains[str] = &Chain{NextString: "", MaxChainLength: 1}
23     }
24
25     // Sort the strings based on their length so that whenever we visit a
26     // string (as we iterate through them from left to right), we can
27     // already have computed the longest string chains of any smaller strings.
28     sort.Slice(strings, func(i, j int) bool {
29         return len(strings[i]) < len(strings[j])
30     })
31     sortedStrings := strings
32
33     for _, str := range sortedStrings {
34         findLongestStringChain(str, stringChains)
35     }
36     return buildLongestStringChain(strings, stringChains)
37 }
38
39 func findLongestStringChain(str string, stringChains map[string]*Chain) {
40     // Try removing every letter of the current string to see if the
41     // remaining strings form a string chain.
42     for i := range str {
43         smallerString := getSmallerString(str, i)
44         if _, found := stringChains[smallerString]; !found {
45             continue
46         }
47         tryUpdateLongestStringChain(str, smallerString, stringChains)
48     }
49 }
50
51 func getSmallerString(str string, index int) string {
52     return str[:index] + str[index+1:]
53 }
54
55 func tryUpdateLongestStringChain(currentString, smallerString string, stringChains map[string]*Chain) {
56     smallerStringChainLength := stringChains[smallerString].MaxChainLength
57     currentStringChainLength := stringChains[currentString].MaxChainLength
58     // Update the string chain of the current string only if the smaller string leads
59     // to a longer string chain.
60     if smallerStringChainLength+1 > currentStringChainLength {
61         stringChains[currentString].MaxChainLength = smallerStringChainLength + 1
62         stringChains[currentString].NextString = smallerString
63     }
64 }
65
66 func buildLongestStringChain(strings []string, stringChains map[string]*Chain) []string {
67     // Find the string that starts the longest string chain.
68     maxChainLength := 0
69     chainStartingString := ""
70     for _, str := range strings {
71         if stringChains[str].MaxChainLength > maxChainLength {
72             maxChainLength = stringChains[str].MaxChainLength
73             chainStartingString = str
74         }
75     }
76
77     // Starting at the string found above, build the longest string chain.
78     ourLongestStringChain := []string{}
79     currentString := chainStartingString
80     for currentString != "" {
81         ourLongestStringChain = append(ourLongestStringChain, currentString)
82         currentString = stringChains[currentString].NextString
83     }
84     if len(ourLongestStringChain) == 1 {
85         return []string{}
86     }
87     return ourLongestStringChain
88 }
89
```

