```java
class Solution {
    public List<String> restoreIpAddresses(String s) {
        List<String> result = new ArrayList<>();

        if (s == null || s.length() < 4 || s.length() > 12) {
            return result;
        }

        List<List<String>> resultList = new ArrayList<>();

        backtrack(s, resultList, new ArrayList<>(), 0);

                 // processing to specific format
        for (List<String> r : resultList) {
            StringBuilder sb = new StringBuilder();
            for (int i = 0; i < 4; i++) { // each r only contains 4 elements
                sb.append(r.get(i));
                if (i != 3) {
                    sb.append(".");
                }
            }
            result.add(sb.toString());
        }

        return result;
    }

    private void backtrack(String s, List<List<String>> result, List<String>
tempResult, int index) {
        if (tempResult.size() > 4) {
            return;
        }

        if (index == s.length() && tempResult.size() == 4) { // always make sure there are 4 components, and reading the end
            result.add(new ArrayList<>(tempResult));
            return;
        }

        for (int i = 1; i <= 3; i++) {
            int start = index;
            int end = index + i;
            if (end > s.length()) {
                break;
            }
            String subString = s.substring(start, end);
            boolean hasLeadingZero = checkLeadingZero(subString);
            if (hasLeadingZero) {
                break;
            }
            boolean isNumInRange = checkNum(subString);
            if (isNumInRange) {
                tempResult.add(subString);
                backtrack(s, result, tempResult, end);
                tempResult.remove(tempResult.size() - 1);
            } else {
                break;
            }
        }
    }
    private boolean checkLeadingZero(String s) {
        if (s.length() <= 1) {
            return false;
        } else if (s.charAt(0) != '0') {
            return false;
        }

        return true;
    }

    private boolean checkNum(String s) {
        int result = 0;
        for (char c : s.toCharArray()) {
            int n = c - '0';
            result = result * 10 + n;
        }

        if (result >= 0 && result <= 255) {
            return true;
        }

        return false;
    }
}
```