Program – 3

For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

The CSV File:

Sky	AirTemp	Humidity	Wind	Water	Forecast	EnjoySport
Sunny	Warm	Normal	Strong	Warm	Same	Yes
Sunny	Warm	High	Strong	Warm	Same	Yes
Rainy	Cold	High	Strong	Warm	Change	No
Sunny	Warm	High	Strong	Cold	Change	Yes

Python Code:

```
#Importing Important Libraries
import numpy as np
import pandas as pd

data=pd.read_csv('C:/Users/ISE-LAB7/Documents/P3Data.csv')
print(data)
concepts=np.array(data.iloc[:,0:-1])
print(concepts)
target= np.array(data.iloc[:,-1])
print(target)

#Candidate Elimination algorithm
def learn(concepts, target):
    specific_h = concepts[0].copy()
    print("\nInitialization of specific_h and genearal_h")
    print("\nSpecific hypothesis: ", specific_h)
    general_h = [["?" for i in range(len(specific_h))] for i in
range(len(specific_h))]
    print("\nGeneric hypothesis: ",general_h)
    for i, h in enumerate(concepts):
        print("\nInstance", i+1, "is ", h)
        if target[i] == "Yes":
            print("Instance is Positive ")
            for x in range(len(specific_h)):
                if h[x]!= specific_h[x] :
```

```
                specific_h[x] ='?'
                general_h[x][x] ='?'
        if target[i] == "No":
            print("Instance is Negative ")
            for x in range(len(specific_h)):
                if h[x] != specific_h[x]:
                    general_h[x][x] = specific_h[x]
                else:
                    general_h[x][x] ='?'
        print("Specific hypothesis after ", i+1, "Instance is ", specific_h)
        print("Generic hypothesis after ", i+1, "Instance is ", general_h)
        print("\n")
    indices = [i for i, val in enumerate(general_h) if val == ['?', '?', '?', '?', '?', '?']]
    for i in indices:
        general_h.remove(["?", "?", "?", "?", "?", "?"])
    return specific_h, general_h

s_final, g_final = learn (concepts, target)
print("Final Specific_h: ", s_final, sep="\n")
print("Final General_h: ", g_final, sep="\n")
```

Output:

```
    Sky AirTemp Humidity    Wind Water Forecast EnjoySport
0  Sunny    Warm   Normal  Strong  Warm     Same       Yes
1  Sunny    Warm     High  Strong  Warm     Same       Yes
2  Rainy    Cold     High  Strong  Warm   Change        No
3  Sunny    Warm     High  Strong  Cold   Change       Yes
[['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
 ['Sunny' 'Warm' 'High' 'Strong' 'Warm' 'Same']
 ['Rainy' 'Cold' 'High' 'Strong' 'Warm' 'Change']
 ['Sunny' 'Warm' 'High' 'Strong' 'Cold' 'Change']]
['Yes' 'Yes' 'No' 'Yes']
```

Initialization of specific_h and genearal_h

Specific hypothesis: ['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']

Generic hypothesis: [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 1 is ['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
Instance is Positive
Specific hypothesis after 1 Instance is ['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']
Generic hypothesis after 1 Instance is [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 2 is ['Sunny' 'Warm' 'High' 'Strong' 'Warm' 'Same']
Instance is Positive
Specific hypothesis after 2 Instance is ['Sunny' 'Warm' '?' 'Strong' 'Warm' 'Same']
Generic hypothesis after 2 Instance is [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 3 is ['Rainy' 'Cold' 'High' 'Strong' 'Warm' 'Change']
Instance is Negative
Specific hypothesis after 3 Instance is ['Sunny' 'Warm' '?' 'Strong' 'Warm' 'Same']
Generic hypothesis after 3 Instance is [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', 'Same']]

Instance 4 is ['Sunny' 'Warm' 'High' 'Strong' 'Cold' 'Change']
Instance is Positive
Specific hypothesis after 4 Instance is ['Sunny' 'Warm' '?' 'Strong' '?' '?']
Generic hypothesis after 4 Instance is [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Final Specific_h:
['Sunny' 'Warm' '?' 'Strong' '?' '?']
Final General_h:
[['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?']]