Desh Iyer | 500081889 | Experiment - 3

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1 Experiment 3 - Candidate Elimination Algorithm for Hypothesis Testing

1.1 Import Libraries

```python
import numpy as np
import pandas as pd
```

1.2 Extract Data

```python
data = pd.read_csv('data.csv')

concepts = np.array(data.iloc[:, 0:-1])
target = np.array(data.iloc[:, -1])

print("\nInstances are:\n",concepts)
print("\nTarget values are:\n",target)
```

```
Instances are:
 [['Sunny' 'Warm' 'High' 'Strong' 'Warm' 'Same']
 ['Rainy' 'Cold' 'High' 'Strong' 'Warm' 'Change']
 ['Sunny' 'Warm' 'High' 'Strong' 'Cool' 'Change']]

Target values are:
 ['Yes' 'No' 'Yes']
```

1.3 Define Function to *Learn* Dataset

```python
def learn(concepts, target):
    specific_h = concepts[0]
    general_h = [["?" for i in range(len(specific_h))] for i in
    →range(len(specific_h))]

    print("\nInitializing hypotheses")
    print("\nSpecific Boundary: ", specific_h)
    print("\nGeneric Boundary:\n",general_h)
```

```python
    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 boundary after", i + 1, "iteration is ", specific_h)
        print("Generic boundary after", i + 1, "iteration 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
```

1.4 Generate Hypotheses

```python
s_final, g_final = learn(concepts, target)

print("Final Specific Hypothesis: ", s_final, sep="\n")
print("Final General Hypothesis: ", g_final, sep="\n")
```

```
Initializing hypotheses

Specific Boundary:  ['Sunny' 'Warm' 'High' 'Strong' 'Warm' 'Same']

Generic Boundary:
 [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?',
'?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?',
'?'], ['?', '?', '?', '?', '?', '?']]

Instance 1 is  ['Sunny' 'Warm' 'High' 'Strong' 'Warm' 'Same']
Specific boundary after 1 iteration is  ['Sunny' 'Warm' 'High' 'Strong' 'Warm'
```

'Same']
Generic boundary after 1 iteration is [['?', '?', '?', '?', '?', '?'], ['?',
'?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?',
'?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 2 is ['Rainy' 'Cold' 'High' 'Strong' 'Warm' 'Change']
Specific boundary after 2 iteration is ['Sunny' 'Warm' 'High' 'Strong' 'Warm'
'Same']
Generic boundary after 2 iteration is [['?', '?', '?', '?', '?', '?'], ['?',
'?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?',
'?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 3 is ['Sunny' 'Warm' 'High' 'Strong' 'Cool' 'Change']
Specific boundary after 3 iteration is ['Sunny' 'Warm' 'High' 'Strong' 'Warm'
'Same']
Generic boundary after 3 iteration is [['?', '?', '?', '?', '?', '?'], ['?',
'?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?',
'?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Final Specific Hypothesis:
['Sunny' 'Warm' 'High' 'Strong' 'Warm' 'Same']
Final General Hypothesis:
[]