

## IMPLEMENT THE FOLLOWING USING PYTHON

## DATA SETS :-

## Finds.csv

	A	B	C	D
1	nose	cough	skin	class
2	running no	coughing	red skin	yes
3	running no	coughing	normal	yes
4	running no	normal	red skin	no
5	normal	coughing	red skin	no
6	normal	normal	red skin	no
7	normal	normal	normal	no

## health.csv

	A	B	C	D	E	F	G
1	sky	air temp	humidity	wind	water	forecast	enjoy sport
2	sunny	warm	normal	strong	warm	same	yes
3	sunny	warm	high	strong	warm	same	yes
4	rainy	cold	high	strong	warm	change	no
5	sunny	warm	high	strong	cool	change	yes

## FIND S ALGORITHM

```
import pandas as pd
import numpy as np

#to read the data in the csv file
data = pd.read_csv("health.csv")
print(data,"n")

#making an array of all the attributes
d = np.array(data)[:,:-1]
print("n The attributes are: ",d)

#segragating the target that has positive and negative examples
target = np.array(data)[:,-1]
print("n The target is: ",target)

#training function to implement find-s algorithm
def train(c,t):
    for i, val in enumerate(t):
        if val == "yes":
            specific_hypothesis = c[i].copy()
            break

    for i, val in enumerate(c):
        if t[i] == "yes":
            for x in range(len(specific_hypothesis)):
                if val[x] != specific_hypothesis[x]:
                    specific_hypothesis[x] = '?'
            else:
                pass

    return specific_hypothesis

#obtaining the final hypothesis
print("n The final hypothesis is:",train(d,target))
```

## OUTPUT :-

### finds.csv

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	sky	air temp	humidity	wind	water	forecast	enjoy	sport
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	cool	change		yes

n The attributes are: [['sunny' 'warm' 'normal' 'strong' 'warm' 'same']  
['sunny' 'warm' 'high' 'strong' 'warm' 'same']  
['rainy' 'cold' 'high' 'strong' 'warm' 'change']  
['sunny' 'warm' 'high' 'strong' 'cool' 'change']]

n The target is: ['yes' 'yes' 'no' 'yes']

n The final hypothesis is: ['sunny' 'warm' '?' 'strong' '?' '?']

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### health.csv

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	nose	cough	skin	class
0	running nose	coughing	red skin	yes
1	running nose	coughing	normal	yes
2	running nose	normal	red skin	no
3	normal	coughing	red skin	no
4	normal	normal	red skin	no
5	normal	normal	normal	no

n The attributes are: [['running nose' 'coughing' 'red skin']  
['running nose' 'coughing' 'normal']  
['running nose' 'normal' 'red skin']  
['normal' 'coughing' 'red skin']  
['normal' 'normal' 'red skin']  
['normal' 'normal' 'normal']]

n The target is: ['yes' 'yes' 'no' 'no' 'no' 'no']

n The final hypothesis is: ['running nose' 'coughing' '?']

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## CANDIDATE ELIMINATION ALGORITHM

```
import numpy as np
import pandas as pd

data = pd.read_csv('finds.csv')
concepts = np.array(data.iloc[:,0:-1])
print("\nInstances are:\n",concepts)
target = np.array(data.iloc[:, -1])
print("\nTarget Values are: ",target)

def learn(concepts, target):
    specific_h = concepts[0].copy()
    print("\nInitialization of specific_h and general_h")
    print("\nSpecific Boundary: ", specific_h)
    general_h = [["?" for i in range(len(specific_h))] for i in range(len(specific_h))]
    print("\nGeneric Boundary: ",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 Boundary after ", i+1, "Instance is ", specific_h)
        print("Generic Boundary 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 :-

### finds.csv

```
Instances are:
[['sunny' 'warm' 'normal' 'strong' 'warm' 'same']
 ['sunny' 'warm' 'high' 'strong' 'warm' 'same']
 ['rainy' 'cold' 'high' 'strong' 'warm' 'change']
 ['sunny' 'warm' 'high' 'strong' 'cool' 'change']]

Target Values are: ['yes' 'yes' 'no' 'yes']

Initialization of specific_h and general_h

Specific Boundary: ['sunny' 'warm' 'normal' 'strong' 'warm' 'same']

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

Instance 1 is ['sunny' 'warm' 'normal' 'strong' 'warm' 'same']
Instance is Positive
Specific Boundary after 1 Instance is ['sunny' 'warm' 'normal' 'strong' 'warm' 'same']
Generic Boundary after 1 Instance is [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 2 is ['sunny' 'warm' 'high' 'strong' 'warm' 'same']
Instance is Positive
Specific Boundary after 2 Instance is ['sunny' 'warm' '?' 'strong' 'warm' 'same']
Generic Boundary after 2 Instance is [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 3 is ['rainy' 'cold' 'high' 'strong' 'warm' 'change']
Instance is Negative
Specific Boundary after 3 Instance is ['sunny' 'warm' '?' 'strong' 'warm' 'same']
Generic Boundary after 3 Instance is [['sunny', '?', '?', '?', '?', '?'], ['?', 'warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance 4 is ['sunny' 'warm' 'high' 'strong' 'cool' 'change']
Instance is Positive
Specific Boundary after 4 Instance is ['sunny' 'warm' '?' 'strong' '?' '?']
Generic Boundary after 4 Instance is [['sunny', '?', '?', '?', '?', '?'], ['?', 'warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Final Specific_h:
['sunny' 'warm' '?' 'strong' '?' '?']
Final General_h:
[['sunny', '?', '?', '?', '?', '?'], ['?', 'warm', '?', '?', '?', '?']]
```

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## health.csv

Instances are:

```
['running nose' 'coughing' 'red skin']  
['running nose' 'coughing' 'normal']  
['running nose' 'normal' 'red skin']  
['normal' 'coughing' 'red skin']  
['normal' 'normal' 'red skin']  
['normal' 'normal' 'normal']
```

Target Values are: ['yes' 'yes' 'no' 'no' 'no' 'no']

Initialization of specific\_h and general\_h

Specific Boundary: ['running nose' 'coughing' 'red skin']

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

Instance 1 is ['running nose' 'coughing' 'red skin']

Instance is Positive

Specific Boundary after 1 Instance is ['running nose' 'coughing' 'red skin']

Generic Boundary after 1 Instance is [['?', '?', '?'], ['?', '?', '?'], ['?', '?', '?']]

Instance 2 is ['running nose' 'coughing' 'normal']

Instance is Positive

Specific Boundary after 2 Instance is ['running nose' 'coughing' '?']

Generic Boundary after 2 Instance is [['?', '?', '?'], ['?', '?', '?'], ['?', '?', '?']]

Instance 3 is ['running nose' 'normal' 'red skin']

Instance is Negative

Specific Boundary after 3 Instance is ['running nose' 'coughing' '?']

Generic Boundary after 3 Instance is [['?', '?', '?'], ['?', 'coughing', '?'], ['?', '?', '?']]

Instance 4 is ['normal' 'coughing' 'red skin']

Instance is Negative

Specific Boundary after 4 Instance is ['running nose' 'coughing' '?']

Generic Boundary after 4 Instance is [['running nose', '?', '?'], ['?', '?', '?'], ['?', '?', '?']]

Instance 5 is ['normal' 'normal' 'red skin']

Instance is Negative

Specific Boundary after 5 Instance is ['running nose' 'coughing' '?']

Generic Boundary after 5 Instance is [['running nose', '?', '?'], ['?', 'coughing', '?'], ['?', '?', '?']]

Instance 6 is ['normal' 'normal' 'normal']

Instance is Negative

Specific Boundary after 6 Instance is ['running nose' 'coughing' '?']

Generic Boundary after 6 Instance is [['running nose', '?', '?'], ['?', 'coughing', '?'], ['?', '?', '?']]

Final Specific\_h:

['running nose' 'coughing' '?']

Final General\_h:

['running nose', '?', '?'], ['?', 'coughing', '?'], ['?', '?', '?']