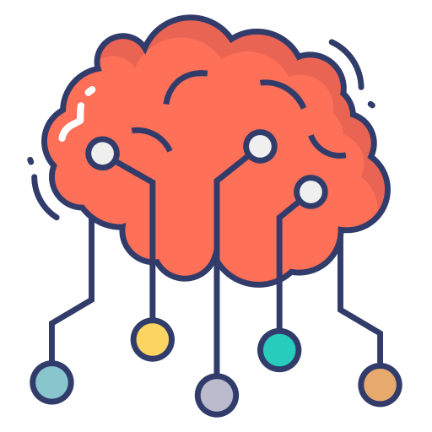


LAB REPORT

**CSE4020 – MACHINE LEARNING**

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**(B.Tech. COMPUTER SCIENCE AND ENGINEERING)**

**FALL SEMESTER 2021-22**

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| --- | --- |
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**VIT – A Place to Learn; A Chance to Grow**

1. **Implement and demonstrate the Candidate Elimination algorithm for finding the most consistent version space based on a given set of training data samples. Read the training data from a .CSV file.**

***Candidate Elimination Algorithms***

For each training example d, do:

If d is positive example

Remove from G any hypothesis h inconsistent with d

For each hypothesis s in S not consistent with d:

Remove s from S

Add to S all minimal generalizations of s consistent with d and having a generalization in G

Remove from S any hypothesis with a more specific h in S

If d is negative example

Remove from S any hypothesis h inconsistent with d

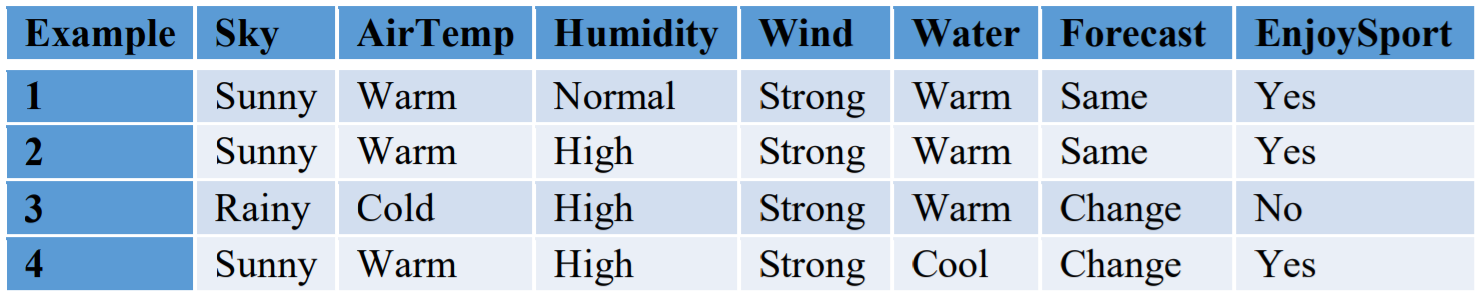
For each hypothesis g in G not consistent with d:

Remove g from G

Add to G all minimal specializations of g consistent with d and having a specialization in S

Remove from G any hypothesis having a more general hypothesis in G

***Training Example:***



**PROGRAM –**

import pandas as pd

import numpy as np

df = pd.read\_csv('data.csv')

print("Given Data Set : \n")

print(df,"\n")

def learn(concepts, target):

for i in range(len(target)):

if target[i]=='Yes':

specific\_hypothesis = concepts[i].copy()

break

general\_hypothesis = [["?" for i in range(len(specific\_hypothesis))]for i in range(len(specific\_hypothesis))]

print("Initialization of specific\_hypothesis and genearal\_hypothesis\n")

print("Specific Boundary : ",specific\_hypothesis,"\n")

print("General Boundary : ",general\_hypothesis,"\n")

for i in range(len(concepts)):

if target[i]=="Yes":

print("Instance is Positive")

for j in range(len(concepts[i])):

if concepts[i][j]!=specific\_hypothesis[j]:

specific\_hypothesis[j] = "?"

general\_hypothesis[j][j] = "?"

if target[i]=="No":

print("Instance is Negative")

for j in range(len(concepts[i])):

if concepts[i][j]!=specific\_hypothesis[j]:

general\_hypothesis[j][j] = specific\_hypothesis[j]

else:

general\_hypothesis[j][j] = "?"

print("Specific Bundary after ", i+1, "Instance is ", specific\_hypothesis)

print("Generic Boundary after ", i+1, "Instance is ", general\_hypothesis)

print("\n")

indices = [i for i, val in enumerate(general\_hypothesis) if val == ['?', '?', '?', '?', '?', '?']]

for i in indices:

general\_hypothesis.remove(['?', '?', '?', '?', '?', '?'])

return specific\_hypothesis, general\_hypothesis

concepts = np.array(df)[:,:-1]

print("Instances are : \n")

print(concepts)

print("\n")

target = np.array(df)[:,-1]

print("Target Values are : \n")

print(target)

print("\n")

specific\_hypothesis\_final, general\_hypothesis\_final = learn(concepts, target)

print("Final Specific Hypothesis : ", specific\_hypothesis\_final, sep="\n")

print("\n")

print("Final General Hypothesis : ", general\_hypothesis\_final, sep="\n")

**OUTPUT –**

Given Data Set :

Sky Temp Humid Wind Water Forecast EnjoySpt

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

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\_hypothesis and genearal\_hypothesis

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

General Boundary : [['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Instance is Positive

Specific Bundary after 1 Instance is ['Sunny' 'Warm' 'Normal' 'Strong' 'Warm' 'Same']

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

Instance is Positive

Specific Bundary after 2 Instance is ['Sunny' 'Warm' '?' 'Strong' 'Warm' 'Same']

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

Instance is Negative

Specific Bundary after 3 Instance is ['Sunny' 'Warm' '?' 'Strong' 'Warm' 'Same']

Generic Boundary after 3 Instance is [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', 'Same']]

Instance is Positive

Specific Bundary after 4 Instance is ['Sunny' 'Warm' '?' 'Strong' '?' '?']

Generic Boundary after 4 Instance is [['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?'], ['?', '?', '?', '?', '?', '?']]

Final Specific Hypothesis :

['Sunny' 'Warm' '?' 'Strong' '?' '?']

Final General Hypothesis :

[['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?']]