Practical-3

Objective: To implement Bayes classifier using multiple class and multiple features.

Classes: { yes, no }

Features: chills, runny nose, headache, fever.

Training:

Chills	Runny nose	Headache	Fever	Flu
Y	N	Mild	Y	N
Y	Y	No	N	Y
Y	N	Strong	Y	Y
N	Y	Mild	Y	Y
N	N	No	N	N
N	Y	Strong	Y	Y
N	Y	Strong	N	N
Y	Y	Mild	Y	Y

Testing: Using *Bayes Theorem* to find the class belongingness of any object.

A priori Probabilities : $P(W_i)$ where i = 1, 2, 3 (for all the 3 classes).

Conditional Probabilities : $P(x_j/W_i)$ for feature x which can take values x_j.

Posteriori Probabilities : that an object has a feature x and also belongs to the class W_i.

$P(W_i/x) = P(x/W_i) * P(W_i) / P(x)$

CODE :

```
import pandas as pd

test = input().split()

df = pd.read_csv("data.csv")
g1 = df.groupby(['flu'])
g2 = df.groupby(['chills', 'flu'])
g3 = df.groupby(['runny nose', 'flu'])
g4 = df.groupby(['headache', 'flu'])
g5 = df.groupby(['fever', 'flu'])

apriori_prob = g1.size().div(len(df))
conditional_prob = [g2.size().div(len(df)).div(apriori_prob, axis=0, level='flu'),
                    g3.size().div(len(df)).div(apriori_prob, axis=0, level='flu'),
```

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                g4.size().div(len(df)).div(apriori_prob, axis=0, level='flu'),
                g5.size().div(len(df)).div(apriori_prob, axis=0, level='flu')]

class1, class2 = apriori_prob[1], apriori_prob[0]

for i, j in zip(test, conditional_prob):
    class1 *= j[i]['Y']
    class2 *= j[i]['N']

if class1 > class2:
    print("YES FLU")
else:
    print("NO FLU")

print()
print("A PRIORI PROBABILITIES")
print(apriori_prob)
print()
print("CONDITIONAL PROBABILITIES")
print(conditional_prob.first())
```

OUTPUT :