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Batch: B

Date: 08/11/2023

## EXP 9: Naive Bayes Classifier

### Program:

```
[3]: import pandas as pd

df = pd.read_excel('PlayGolf.xlsx')

df.iloc[:,1:]

outlook = pd.crosstab(df['Outlook'],df['Play Golf'],margins=True,margins_name='Total')

windy = pd.crosstab(df['Windy'],df['Play Golf'],margins=True,margins_name='Total')

humidity = pd.crosstab(df['Humidity'],df['Play Golf'],margins=True,margins_name='Total')

temp = pd.crosstab(df['Temperature'],df['Play Golf'],margins=True,margins_name='Total')

today = ['Sunny','Cool','High',False]

prob = outlook['Yes'][today[0]]/9 * temp['Yes'][today[1]]/9 * humidity['Yes'][today[2]]/9 * windy['Yes'][today[3]] / 9 * 9/14
prob

[3]: 0.015873015873015872

[4]: probno = outlook['No'][today[0]]/5 * temp['No'][today[1]]/5 * humidity['No'][today[2]]/5 * windy['No'][today[3]] / 5 * 5/14
probno

[4]: 0.009142857142857144

[6]: ansyes = prob / (prob + probno)
ansno = probno / (prob + probno)
ansyes, ansno

[6]: (0.6345177664974619, 0.3654822335025381)

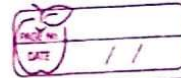
[7]: if ansyes > ansno:
    print('You can play golf!!')
else:
    print('GO HOME!!')

You can play golf!!
```

### Dataset:

	Outlook	Temperature	Humidity	Windy	Play Golf
0	Rainy	Hot	High	FALSE	No
1	Rainy	Hot	High	TRUE	No
2	Overcast	Hot	High	FALSE	Yes
3	Sunny	Mild	High	FALSE	Yes
4	Sunny	Cool	Normal	FALSE	Yes
5	Sunny	Cool	Normal	TRUE	No
6	Overcast	Cool	Normal	TRUE	Yes
7	Rainy	Mild	High	FALSE	No
8	Rainy	Cool	Normal	FALSE	Yes
9	Sunny	Mild	Normal	FALSE	Yes
10	Rainy	Mild	Normal	TRUE	Yes
11	Overcast	Mild	High	TRUE	Yes
12	Overcast	Hot	Normal	FALSE	Yes
13	Sunny	Mild	High	TRUE	No

### Solved:



## \* Naïve Bayes Classifier

### Outlook

	Yes	No	$P(Yes)$	$P(No)$
Sunny	3	2	$3/9$	$2/9$
Rainy	2	3	$2/9$	$3/9$
Bout East	4	0	$4/9$	0
Total	9	5	100%	100%

### Temperature

	Yes	No	$P(Y)$	$P(N)$
Hot	2	2	$2/9$	$2/5$
Mild	4	2	$4/9$	$2/5$
Cool	3	1	$3/9$	$1/5$
Total	9	5	100%	100%

### Humidity

	Yes	No	$P(Y)$	$P(N)$
High	3	4	$3/9$	$4/5$
Normal	6	1	$6/9$	$1/5$
Total	9	5	100%	100%

### Wind

	Yes	No	$P(Y)$	$P(N)$
False	6	2	$6/9$	$2/5$
True	3	3	$3/9$	$3/5$
Total	9	5	100%	100%

### Play

	Yes	No	$P(E)$
Yes	9	5	$9/14$
No			$5/14$
Total	14		100%

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Today = (Rainy, Mild, Normal, False)

$$P(\text{Yes} | \text{Today}) = \frac{P(\text{rainy} | \text{Yes}) \cdot P(\text{mild} | \text{Yes}) \cdot P(\text{Normal} | \text{Yes}) \cdot P(\text{False} | \text{Yes})}{P(\text{Today})}$$

$$\therefore P(\text{Yes} | \text{Today}) \propto \frac{2}{9} \times \frac{4}{9} \times \frac{6}{9} \times \frac{6}{9} \approx 0.04889$$

$$\therefore P(\text{No} | \text{Today}) \propto \frac{3}{5} \times \frac{2}{5} \times \frac{1}{5} \times \frac{2}{5} \approx 0.0192$$

$$\therefore P(\text{Yes} | \text{Today}) + P(\text{No} | \text{Today}) = 1$$

$$\therefore P(\text{Yes} | \text{Today}) = \frac{0.04889}{0.04889 + 0.0192} = 0.6956$$

$$\therefore P(\text{No} | \text{Today}) = \frac{0.0192}{0.04889 + 0.0192} = 0.3043$$

$$\therefore P(\text{Yes} | \text{Today}) > P(\text{No} | \text{Today})$$

$\therefore$  You can play golf today.



Teacher's Signature: \_\_\_\_\_