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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:

* Naive Bayes Classifier

Outlook	Yes	NO	P(Yes)	P(NO)
Sunny	3	2	3/9	2/5
Rainy	2	3	2/9	3/5
Overcast	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
TOLal	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		P(E)
Yes	9	9/14 P(E)
NO	5	5/14
TOLal	14	100%

Teacher's Signature:.....

Today = (Rainy, Mild, Normal, False)

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

$$\therefore P(Yes|Today) \propto \frac{2}{9} \times \frac{4}{9} \times \frac{6}{9} \times \frac{6}{9} \simeq 0.04389$$

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

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

$$\therefore P(Yes|Today) = \frac{0.04389}{0.04389 + 0.0192} = 0.6956$$

$$\therefore P(No|Today) = \frac{0.0192}{0.04389 + 0.0192} = 0.3043$$

$$\therefore P(Yes|Today) > P(No|Today)$$

∴ You can play golf today.