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Class : MCA Sem 2

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Subject : AI ML

1. Implement voting method on titanic dataset by taking random forest as the base estimator

```
import pandas as pd
import numpy as np
from sklearn.ensemble import RandomForestClassifier, VotingClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
from sklearn.preprocessing import LabelEncoder
import seaborn as sns
df = sns.load_dataset('titanic')
df.head()
```

	survived	pclass	sex	age	sibsp	parch	fare	embarked
0	0	3	1	22.0	1	0	7.2500	2
1	1	1	0	38.0	1	0	71.2833	0
2	1	3	0	26.0	0	0	7.9250	2
3	1	1	0	35.0	1	0	53.1000	2
4	0	3	1	35.0	0	0	8.0500	2

```
df = df[['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare', 'embarked']]
df.dropna(inplace=True)
le_sex = LabelEncoder()
df['sex'] = le_sex.fit_transform(df['sex'])
le_embarked = LabelEncoder()
df['embarked'] = le_embarked.fit_transform(df['embarked'])
X = df.drop('survived', axis=1)
y = df['survived']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
rf1 = RandomForestClassifier(n_estimators=50, random_state=1)
rf2 = RandomForestClassifier(n_estimators=100, max_depth=5, random_state=2)
rf3 = RandomForestClassifier(n_estimators=200, max_depth=10, random_state=3)
voting_clf = VotingClassifier(estimators=[
    ('rf1', rf1),
    ('rf2', rf2),
```

```

('rf3', rf3)
], voting='hard')
voting_clf.fit(X_train, y_train)

VotingClassifier(estimators=[('rf1',
                             RandomForestClassifier(n_estimators=50,
                                                      random_state=1)),
                             ('rf2',
                              RandomForestClassifier(max_depth=5,
                                                      random_state=2)),
                             ('rf3',
                              RandomForestClassifier(max_depth=10,
                                                      n_estimators=200,
                                                      random_state=3))])

y_pred = voting_clf.predict(X_test)
acc = accuracy_score(y_test, y_pred)
print(f"Voting Classifier Accuracy: {acc:.4f}")

Voting Classifier Accuracy: 0.7902

```

2. consider the data

EMPName=['Ram','Arun','smita','david'],Age:[29,45,38,52],Department:['sales','marketing','operations','it']]

perform the following transformations:

- 1) create dataframe from the above set of lists
- 2) insert a new column 'Age group' with labels ['young','middle-aged','senior']
- 3) create dummy variable for the categorical feature 'city'

```

import pandas as pd
EMPName = ['Ram', 'Arun', 'Smita', 'David']
Age = [29, 45, 38, 52]
Department = ['sales', 'marketing', 'operations', 'it']
City = ['Mumbai', 'Delhi', 'Bangalore', 'Chennai']
data = {
    'EMPName': ['Ram', 'Arun', 'Smita', 'David'],
    'Age': [29, 45, 38, 52],
    'Department': ['sales', 'marketing', 'operations', 'it'],
    'City': ['Mumbai', 'Delhi', 'Bangalore', 'Chennai']
}
df = pd.DataFrame(data)
print(df)

```

	EMPName	Age	Department	City
0	Ram	29	sales	Mumbai
1	Arun	45	marketing	Delhi
2	Smita	38	operations	Bangalore
3	David	52	it	Chennai

```

def age_group(age):
    if age < 35:
        return 'young'

```

```

elif age < 50:
    return 'middle-aged'
else:
    return 'senior'
df['Age group'] = df['Age'].apply(age_group)
print("\nDataFrame with 'Age group':\n", df)

```

```

DataFrame with 'Age group':
   EMPName  Age  Department    City  Age group
0     Ram   29     sales    Mumbai    young
1    Arun   45  marketing    Delhi  middle-aged
2   Smita   38  operations  Bangalore  middle-aged
3   David   52         it    Chennai    senior

```

```

df_dummies = pd.get_dummies(df, columns=['City'], prefix='City')
print("\nDataFrame with dummy variables for 'City':\n", df_dummies)

```

```

DataFrame with dummy variables for 'City':
   EMPName  Age  Department  Age group  City_Bangalore  City_Chennai \
0     Ram   29     sales    young              0              0
1    Arun   45  marketing  middle-aged              0              0
2   Smita   38  operations  middle-aged              1              0
3   David   52         it    senior              0              1

   City_Delhi  City_Mumbai
0           0           1
1           1           0
2           0           0
3           0           0

```

3. Write a prolog program to solve water jug problem

Code:

```

water_jug(X,Y):-X>4,Y>3,write('4l jug overload'),nl.
water_jug(X,Y):-X<4,Y>3,write('3l jug overload'),nl.
water_jug(X,Y):-X>4,Y>3,write('both jug overloaded'),nl.

water_jug(X,Y):- (X==0,Y==0,nl,write('4L:0 & 3L:0 (Action: fill 3l jug.)'),YY is 3,water_jug(X,YY));
  (X==0,Y==0,nl,write('4L:4 & 3L:0 (Action: fill 4l jug.)'),XX is 4,water_jug(XX,Y));
  (X==2,Y==0,nl,write('4L:2 & 3L:0 (Action: goal.)'));
  (X==4,Y==0,nl,write('4L:1 & 3L:3 (Action: 4l to 3l.)'),XX is X-3,YY is 3,water_jug(XX,YY));
  (X==0,Y==3,nl,write('4L:3 & 3L:0 (Action: 3l to 4l.)'),XX is 3,YY is 0,water_jug(XX,YY));
  (X==1,Y==3,nl,write('4L:1 & 3L:0 (Action: empty 3l.)'),YY is 0,water_jug(X,YY));
  (X==3,Y==0,nl,write('4L:3 & 3L:3 (Action: fill 3l.)'),YY is 3,water_jug(X,YY));
  (X==3,Y==3,nl,write('4L:4 & 3L:2 (Action: 3l to 4l.)'),XX is X+1,YY is Y-1,water_jug(XX,YY));
  (X==1,Y==0,nl,write('4L:0 & 3L:1 (Action: 4l to 3l.)'),XX is Y,YY is X,water_jug(XX,YY));
  (X==0,Y==1,nl,write('4L:4 & 3L:1 (Action: fill 4l.)'),XX is 4,water_jug(XX,YY));
  (X==4,Y==1,nl,write('4L:2 & 3L:3 (Action: 4l to 3l.)'),XX is X-Y,YY is Y+2,water_jug(XX,YY));
  (X==2,Y==3,nl,write('4L:2 & 3L:0 (Action: empty 3l.)'),YY is 0,water_jug(X,YY));

```

```
(X:=4,Y:=2,nl,write('4L:0 & 3L:2 (Action: empty 4l.)'),XX is 0,water_jug(XX,Y));  
(X:=0,Y:=2,nl,write('4L:2 & 3L:0 (Action: 3l to 4l.)'),XX is Y,YY is X,water_jug(XX,YY)).
```

Output:

```
SWI-Prolog (AMD64, Multi-threaded, version 9.2.9)  
File Edit Settings Run Debug Help  
Welcome to SWI-Prolog (threaded, 64 bits, version 9.2.9)  
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.  
Please run ?- license. for legal details.  
  
For online help and background, visit https://www.swi-prolog.org  
For built-in help, use ?- help(Topic). or ?- apropos(Word).  
  
?-  
Warning: c:/users/hiray/desktop/waterjug.pl:5:  
Warning: Singleton variable in branch: YY  
% c:/Users/Hiray/Desktop/waterjug.pl compiled 0.00 sec, 4 clauses  
?- water_jug(4,1).  
  
4L:2 & 3L:3 (Action: 4l to 3l.)  
4L:4 & 3L:2 (Action: 3l to 4l.)  
4L:0 & 3L:2 (Action: empty 4l.)  
4L:2 & 3L:0 (Action: 3l to 4l.)  
4L:2 & 3L:0 (Action: goal.)  
true .  
  
?- water_jug(3,3).  
  
4L:4 & 3L:2 (Action: 3l to 4l.)  
4L:0 & 3L:2 (Action: empty 4l.)  
4L:2 & 3L:0 (Action: 3l to 4l.)  
4L:2 & 3L:0 (Action: goal.)  
true ■
```