In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline

titanic_df = pd.read_csv('./titanic_train.csv')
titanic_df.head(3)
```

Out[1]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S

- passengerid : 탑승자 데이터 일련번호
- survived : 생존여부, 0 = 사망, 1 = 생존
- Pclass : 티켓의 선실 등급. 1 = 일등석, 2 = 이등석, 3 = 삼등석
- name : 탑승자 이름
- sex : 탐승자 성별
- Age : 탐승자 나이
- SibSp : 같이 탑승한 형제자매 또는 배우자 인원수
- Parch : 같이 탑승한 부모님 또는 어린이 인원수
- ticket : 티켓 번호
- Fare : 요금
- cabin : 선실 번호
- embarked : 중간 정착 항구 C = Cherbourg, Q=Queenstown, S=Southampton

In [2]:

```
print('Wn ### train 데이터 정보 ###  Wn')
print(titanic_df.info())
```

```
 ### train 데이터 정보 ###

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
 4   Sex          891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
None
```

- NULL 컬럼들의 대한 처리

In [3]:

```
titanic_df['Age'].fillna(titanic_df['Age'].mean(),inplace=True)
titanic_df['Cabin'].fillna('N',inplace=True)
titanic_df['Embarked'].fillna('N',inplace=True)
print('데이터 세트 Null 값 갯수 ',titanic_df.isnull().sum().sum())
```

```
데이터 세트 Null 값 갯수  0
```

In [4]:

```
print(' Sex 값 분포 :₩n',titanic_df['Sex'].value_counts())
print('₩n Cabin 값 분포 :₩n',titanic_df['Cabin'].value_counts())
print('₩n Embarked 값 분포 :₩n',titanic_df['Embarked'].value_counts())
```

```
 Sex 값 분포 :
 male      577
female    314
Name: Sex, dtype: int64

 Cabin 값 분포 :
 N              687
C23 C25 C27      4
G6               4
B96 B98          4
C22 C26          3
              ...
E34              1
C7               1
C54              1
E36              1
C148             1
Name: Cabin, Length: 148, dtype: int64

 Embarked 값 분포 :
 S    644
C    168
Q     77
N      2
Name: Embarked, dtype: int64
```

In [5]:

```
titanic_df['Cabin'] = titanic_df['Cabin'].str[:1]
print(titanic_df['Cabin'].head(3))
```

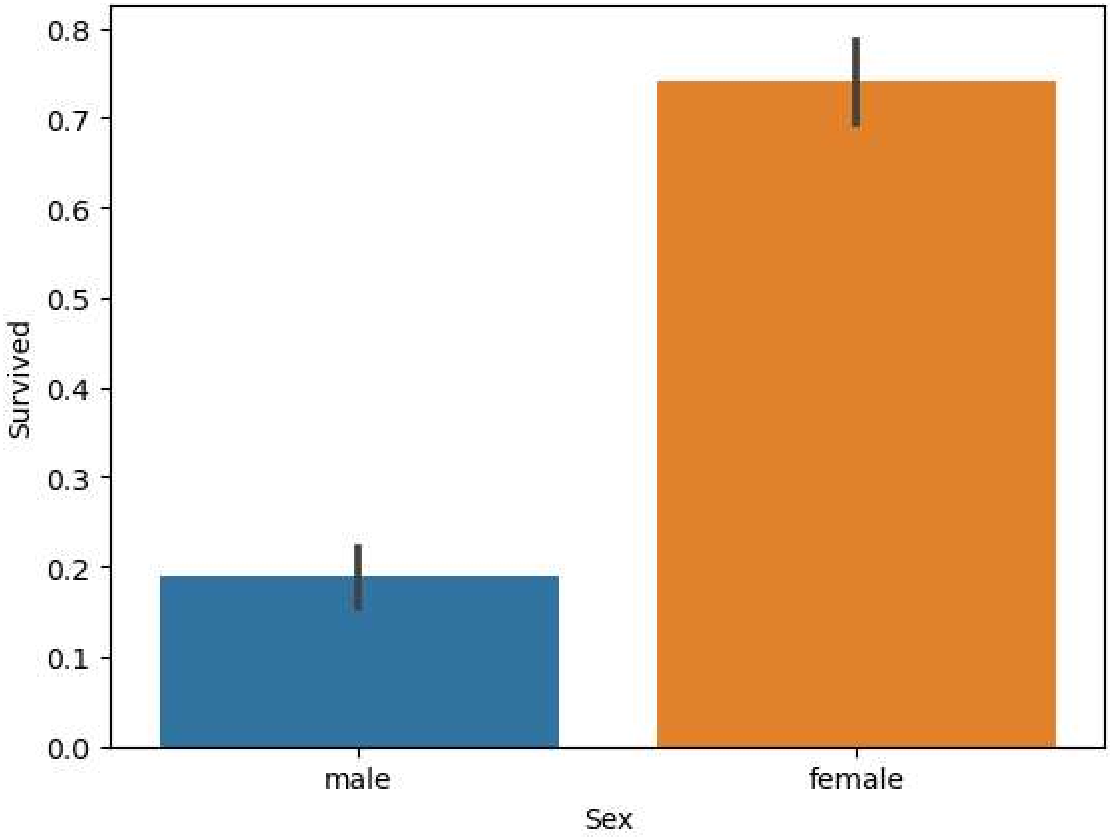
```
0    N
1    C
2    N
Name: Cabin, dtype: object
```

```
In [6]: titanic_df.groupby(['Sex','Survived'])['Survived'].count()
```

```
Out[6]: Sex     Survived
        female  0            81
                1           233
        male    0           468
                1           109
        Name: Survived, dtype: int64
```

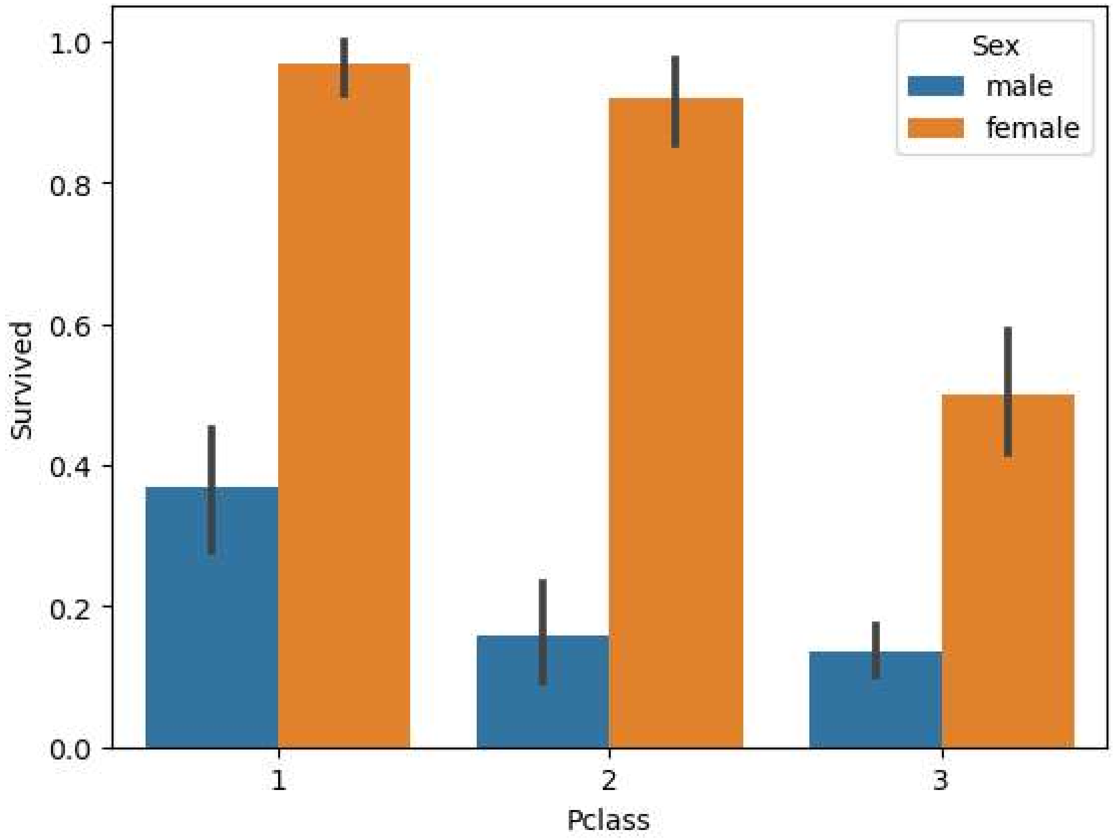
```
In [7]: sns.barplot(x='Sex', y = 'Survived', data=titanic_df)
```

```
Out[7]: <AxesSubplot:xlabel='Sex', ylabel='Survived'>
```



```
In [8]: sns.barplot(x='Pclass', y='Survived', hue='Sex', data=titanic_df)
```

```
Out[8]: <AxesSubplot:xlabel='Pclass', ylabel='Survived'>
```



In [9]:

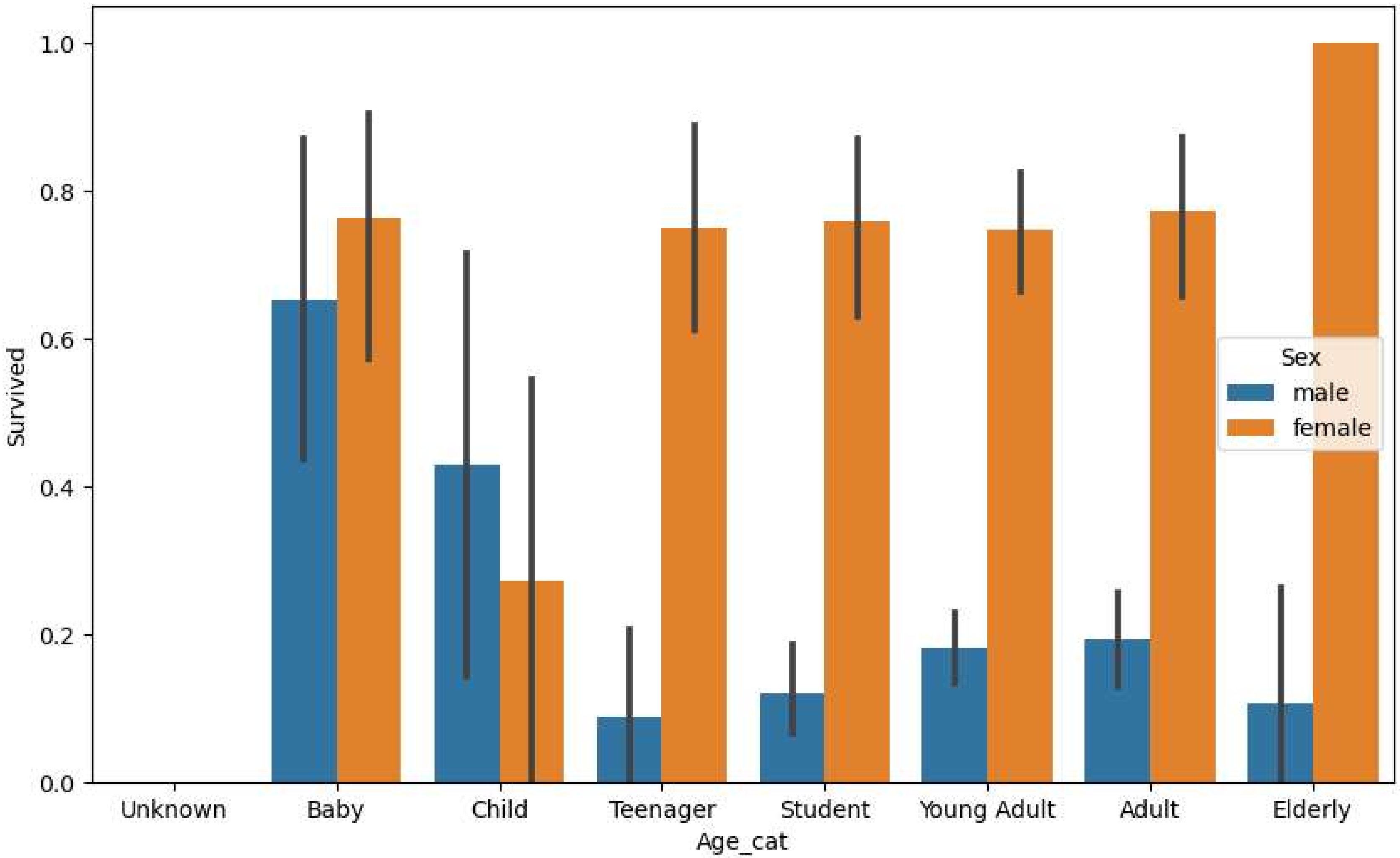
```
# 입력 age에 따라 구분값을 반환하는 함수 설정. DataFrame의 apply lambda식에 사용.
def get_category(age):
    cat = ''
    if age <= -1: cat = 'Unknown'
    elif age <= 5: cat = 'Baby'
    elif age <= 12: cat = 'Child'
    elif age <= 18: cat = 'Teenager'
    elif age <= 25: cat = 'Student'
    elif age <= 35: cat = 'Young Adult'
    elif age <= 60: cat = 'Adult'
    else : cat = 'Elderly'

    return cat

# 막대그래프의 크기 figure를 더 크게 설정
plt.figure(figsize=(10,6))

#X축의 값을 순차적으로 표시하기 위한 설정
group_names = ['Unknown', 'Baby', 'Child', 'Teenager', 'Student', 'Young Adult', 'Adult', 'Elderly']

# lambda 식에 위에서 생성한 get_category( ) 함수를 반환값으로 지정.
# get_category(X)는 입력값으로 'Age' 컬럼값을 받아서 해당하는 cat 반환
titanic_df['Age_cat'] = titanic_df['Age'].apply(lambda x : get_category(x))
sns.barplot(x='Age_cat', y = 'Survived', hue='Sex', data=titanic_df, order=group_names)
titanic_df.drop('Age_cat', axis=1, inplace=True)
```


Survived
1.0
0.8
0.6
0.4
0.2
0.0
Unknown
Baby
Child
Teenager
Student
Young Adult
Adult
Elderly
Age_cat
Sex
male
female

In [10]:

```
from sklearn import preprocessing

def encode_features(dataDF):
    features = ['Cabin', 'Sex', 'Embarked']
    for feature in features:
        le = preprocessing.LabelEncoder()
        le = le.fit(dataDF[feature])
        dataDF[feature] = le.transform(dataDF[feature])

    return dataDF

titanic_df = encode_features(titanic_df)
titanic_df.head()
```

Out[10]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	1	22.0	1	0	A/5 21171	7.2500	7	3
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	0	38.0	1	0	PC 17599	71.2833	2	0
2	3	1	3	Heikkinen, Miss. Laina	0	26.0	0	0	STON/O2. 3101282	7.9250	7	3
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	0	35.0	1	0	113803	53.1000	2	3
4	5	0	3	Allen, Mr. William Henry	1	35.0	0	0	373450	8.0500	7	3

In [11]:

```
from sklearn.preprocessing import LabelEncoder

# Null 처리 함수
def fillna(df):
    df['Age'].fillna(df['Age'].mean(),inplace=True)
    df['Cabin'].fillna('N',inplace=True)
    df['Embarked'].fillna('N',inplace=True)
    df['Fare'].fillna(0,inplace=True)
    return df

# 머신러닝 알고리즘에 불필요한 속성 제거
def drop_features(df):
    df.drop(['PassengerId','Name','Ticket'],axis=1,inplace=True)
    return df

# 레이블 인코딩 수행.
def format_features(df):
    df['Cabin'] = df['Cabin'].str[:1]
    features = ['Cabin','Sex','Embarked']
    for feature in features:
        le = LabelEncoder()
        le = le.fit(df[feature])
        df[feature] = le.transform(df[feature])
    return df

# 앞에서 설정한 Data Preprocessing 함수 호출
def transform_features(df):
    df = fillna(df)
    df = drop_features(df)
    df = format_features(df)
    return df
```

In [12]:

```
# 원본 데이터를 재로딩 하고, feature데이터 셋과 Label 데이터 셋 추출.
titanic_df = pd.read_csv('./titanic_train.csv')
y_titanic_df = titanic_df['Survived']
X_titanic_df= titanic_df.drop('Survived',axis=1)

X_titanic_df = transform_features(X_titanic_df)
```

In [13]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test=train_test_split(X_titanic_df, y_titanic_df, ₩
                                                  test_size=0.2, random_state=11)
```

In [14]:

```
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score

# 결정트리, Random Forest, 로지스틱 회귀를 위한 사이킷런 Classifier 클래스 생성
dt_clf = DecisionTreeClassifier(random_state=11)
rf_clf = RandomForestClassifier(random_state=11)
lr_clf = LogisticRegression()

# DecisionTreeClassifier 학습/예측/평가
dt_clf.fit(X_train , y_train)
dt_pred = dt_clf.predict(X_test)
print('DecisionTreeClassifier 정확도: {0:.4f}'.format(accuracy_score(y_test, dt_pred)))

# RandomForestClassifier 학습/예측/평가
rf_clf.fit(X_train , y_train)
rf_pred = rf_clf.predict(X_test)
print('RandomForestClassifier 정확도:{0:.4f}'.format(accuracy_score(y_test, rf_pred)))

# LogisticRegression 학습/예측/평가
lr_clf.fit(X_train , y_train)
lr_pred = lr_clf.predict(X_test)
print('LogisticRegression 정확도: {0:.4f}'.format(accuracy_score(y_test, lr_pred)))
```

```
DecisionTreeClassifier 정확도: 0.7877
RandomForestClassifier 정확도:0.8547
LogisticRegression 정확도: 0.8492

C:₩ProgramData₩Anaconda3₩lib₩site-packages₩sklearn₩linear_model₩_logistic.py:814: ConvergenceWarning: lbfgs failed to converge
(status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html (https://scikit-learn.org/stable/modules/preprocessing.html)
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression (https://scikit-learn.org/stable/modules/lin
ear_model.html#logistic-regression)
  n_iter_i = _check_optimize_result(
```

In [15]:

```
from sklearn.model_selection import KFold

def exec_kfold(clf, folds=5):
    # 폴드 세트를 5개인 KFold객체를 생성, 폴드 수만큼 예측결과 저장을 위한  리스트 객체 생성.
    kfold = KFold(n_splits=folds)
    scores = []

    # KFold 교차 검증 수행.
    for iter_count , (train_index, test_index) in enumerate(kfold.split(X_titanic_df)):
        # X_titanic_df 데이터에서 교차 검증별로 학습과 검증 데이터를 가리키는 index 생성
        X_train, X_test = X_titanic_df.values[train_index], X_titanic_df.values[test_index]
        y_train, y_test = y_titanic_df.values[train_index], y_titanic_df.values[test_index]

        # Classifier 학습, 예측, 정확도 계산
        clf.fit(X_train, y_train)
        predictions = clf.predict(X_test)
        accuracy = accuracy_score(y_test, predictions)
        scores.append(accuracy)
        print("교차 검증 {0} 정확도: {1:.4f}".format(iter_count, accuracy))

    # 5개 fold에서의 평균 정확도 계산.
    mean_score = np.mean(scores)
    print("평균 정확도: {0:.4f}".format(mean_score))
# exec_kfold 호출
exec_kfold(dt_clf , folds=5)
```

```
교차 검증 0 정확도: 0.7542
교차 검증 1 정확도: 0.7809
교차 검증 2 정확도: 0.7865
교차 검증 3 정확도: 0.7697
교차 검증 4 정확도: 0.8202
평균 정확도: 0.7823
```

In [16]:

```
from sklearn.model_selection import cross_val_score

scores = cross_val_score(dt_clf, X_titanic_df , y_titanic_df , cv=5)
for iter_count,accuracy in enumerate(scores):
    print("교차 검증 {0} 정확도: {1:.4f}".format(iter_count, accuracy))

print("평균 정확도: {0:.4f}".format(np.mean(scores)))
```

```
교차 검증 0 정확도: 0.7430
교차 검증 1 정확도: 0.7753
교차 검증 2 정확도: 0.7921
교차 검증 3 정확도: 0.7865
교차 검증 4 정확도: 0.8427
평균 정확도: 0.7879
```

In [17]:

```
from sklearn.model_selection import GridSearchCV

parameters = {'max_depth':[2,3,5,10],
             'min_samples_split':[2,3,5], 'min_samples_leaf':[1,5,8]}

grid_dclf = GridSearchCV(dt_clf , param_grid=parameters , scoring='accuracy' , cv=5)
grid_dclf.fit(X_train , y_train)

print('GridSearchCV 최적 하이퍼 파라미터 :',grid_dclf.best_params_)
print('GridSearchCV 최고 정확도: {0:.4f}'.format(grid_dclf.best_score_))
best_dclf = grid_dclf.best_estimator_

# GridSearchCV의 최적 하이퍼 파라미터로 학습된 Estimator로 예측 및 평가 수행.
dpredictions = best_dclf.predict(X_test)
accuracy = accuracy_score(y_test , dpredictions)
print('테스트 세트에서의 DecisionTreeClassifier 정확도 : {0:.4f}'.format(accuracy))
```

```
GridSearchCV 최적 하이퍼 파라미터 : {'max_depth': 3, 'min_samples_leaf': 5, 'min_samples_split': 2}
GridSearchCV 최고 정확도: 0.7992
테스트 세트에서의 DecisionTreeClassifier 정확도 : 0.8715
```

In [ ]: