01. 기본- 결정트리(decision tree)

- date : 22/05

데이터 셋 다운로드

- UCI : https://www.kaggle.com/uciml/pima-indians-diabetes-database
- 피마 인디언 당뇨병 발병 예측

(가) decision tree는 classification(분류)와 regression(회귀) 문제에 널리 사용하는 모델이다.
(나) 스무고개 놀이의 질문과 비슷하다.

In [46]:
```
# 라이브러리 불러오기
import pandas as pd
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
```

Data Fields

구분	설명
Pregnancies	임신
Glucose	포도당
BloodPressure	혈압
SkinThickness	피부두께
Insulin	인슐린
BMI	BMI 111
Diabetes Pedigree Function	당뇨병혈통기능
Age	나이
Outcome	결과

In [47]:
```
pima = pd.read_csv("diabetes.csv")
```

In [48]:
```
pima.columns
```

Out[48]:
```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

In [49]:
```
pima.head()
```

Out[49]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
0	6	148	72	35	0	33.6	0.627	50
1	1	85	66	29	0	26.6	0.351	31
2	8	183	64	0	0	23.3	0.672	32
3	1	89	66	23	94	28.1	0.167	21

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
4	0	137	40	35	168	43.1	2.288	33

Feature Selection

In [50]:
```
pima.columns
```

Out[50]:
```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

In [51]:
```
pima.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               768 non-null    int64  
 1   Glucose                   768 non-null    int64  
 2   BloodPressure             768 non-null    int64  
 3   SkinThickness             768 non-null    int64  
 4   Insulin                   768 non-null    int64  
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64  
 8   Outcome                   768 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

In [52]:
```
pima.head(3)
```

Out[52]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
0	6	148	72	35	0	33.6	0.627	50
1	1	85	66	29	0	26.6	0.351	31
2	8	183	64	0	0	23.3	0.672	32

In [53]:
```
pima.columns
```

Out[53]:
```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

In [54]:
```
# 데이터 셋 (feature와 target 변수로 나누기)
feature_cols = ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age']
X = pima[feature_cols] # Features
y = pima.Outcome       # Target variable
```

데이터 나누기

In [55]:
```
# 데이터 셋 나누기
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=
```

In [56]:
```
print(X_test.columns)
```

```
print(X_train.columns)
print(y_train.shape)
```

```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age'],
      dtype='object')
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age'],
      dtype='object')
(537,)
```

In [57]:
```
# 의사결정 트리 모델 생성 및 학습
model = DecisionTreeClassifier(max_depth=5, random_state=0).fit(X_train,y_train)

# 예측
y_pred = model.predict(X_test)
```

모델 평가

In [58]:
```
from sklearn import metrics
```

In [59]:
```
# Model Accuracy, 얼마나 정확한가? 정확도
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

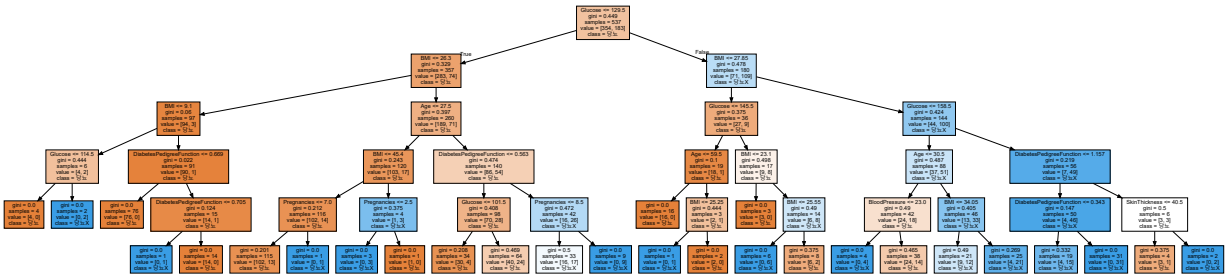
```
Accuracy: 0.7575757575757576
```

시각화 1

In [60]:
```
from sklearn.tree import export_graphviz
export_graphviz(model, out_file="tree.dot",
                class_names=['당뇨', '당뇨X'],
                feature_names = feature_cols,
                impurity = True,  # gini 계수
                filled=True)      # color

import graphviz
with open("tree.dot") as f:
  dot_graph = f.read()

display(graphviz.Source(dot_graph))
```



시각화 2

- png파일로 만들기

In [61]:
```
import pydotplus
from IPython.display import Image
```

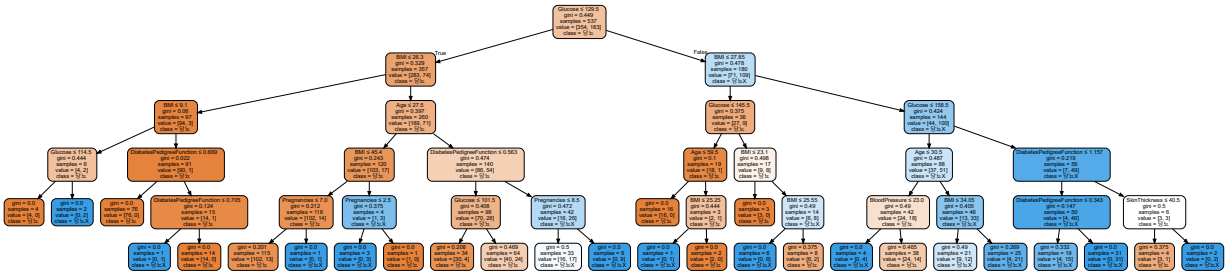
In [62]:
```
import graphviz

# model : 모델명,
# class_n : 클래스명,
# feature_n : 특징 이름
```

```
def tree_plot(model, class_n, feature_n):
  export_graphviz(model, out_file="tree.dot",
                  class_names = class_n,
                  feature_names = feature_n,
                  impurity = True,  # gini 계수
                  filled=True,
                  rounded=True,
                  special_characters=True)       # color

  with open("tree.dot") as f:
    dot_graph = f.read()
  display(graphviz.Source(dot_graph))

tree_plot(model, ['당뇨', '당뇨X'], feature_cols)
```



모델 성능 개선

In [63]:
```
model = DecisionTreeClassifier(criterion="entropy",
                               max_depth=3,
                               random_state=0)  # 의사결정트리 모델
model.fit(X_train,y_train)   # 학습
y_pred = model.predict(X_test)  # 데이터 셋 예측

# 정확도 확인
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.7705627705627706
```