#2018107115 고지영

인공지능 발표

목차

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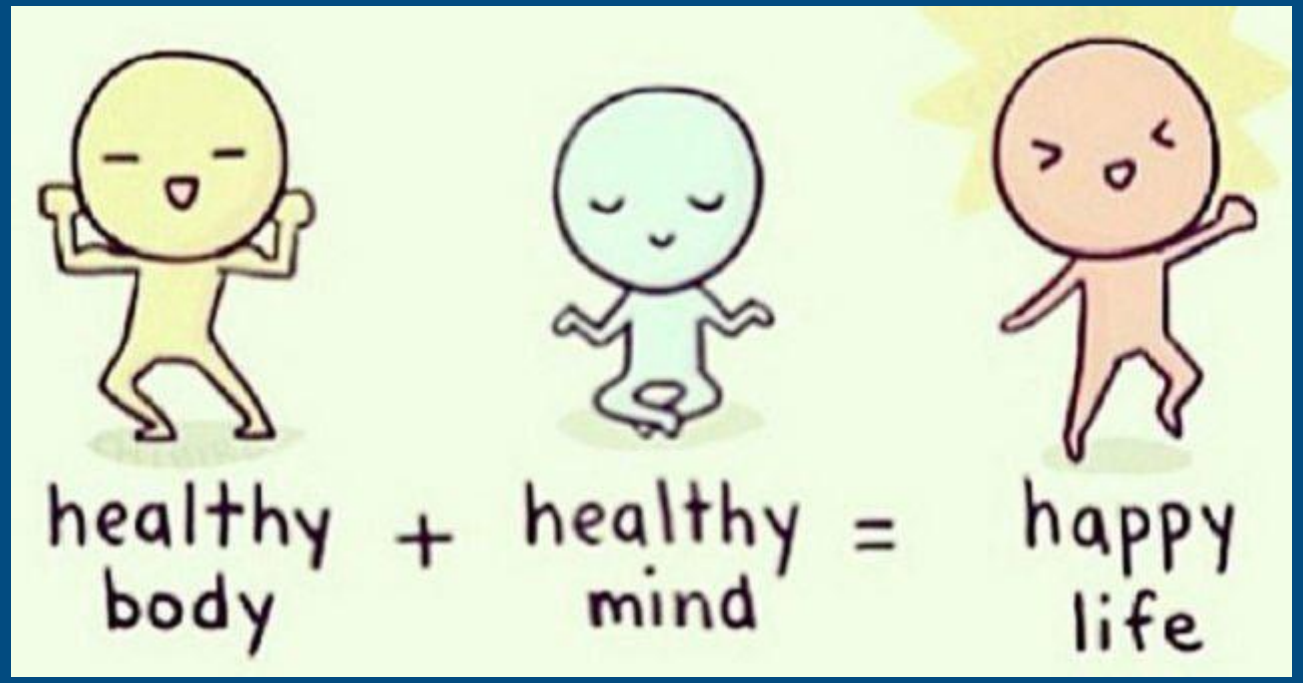
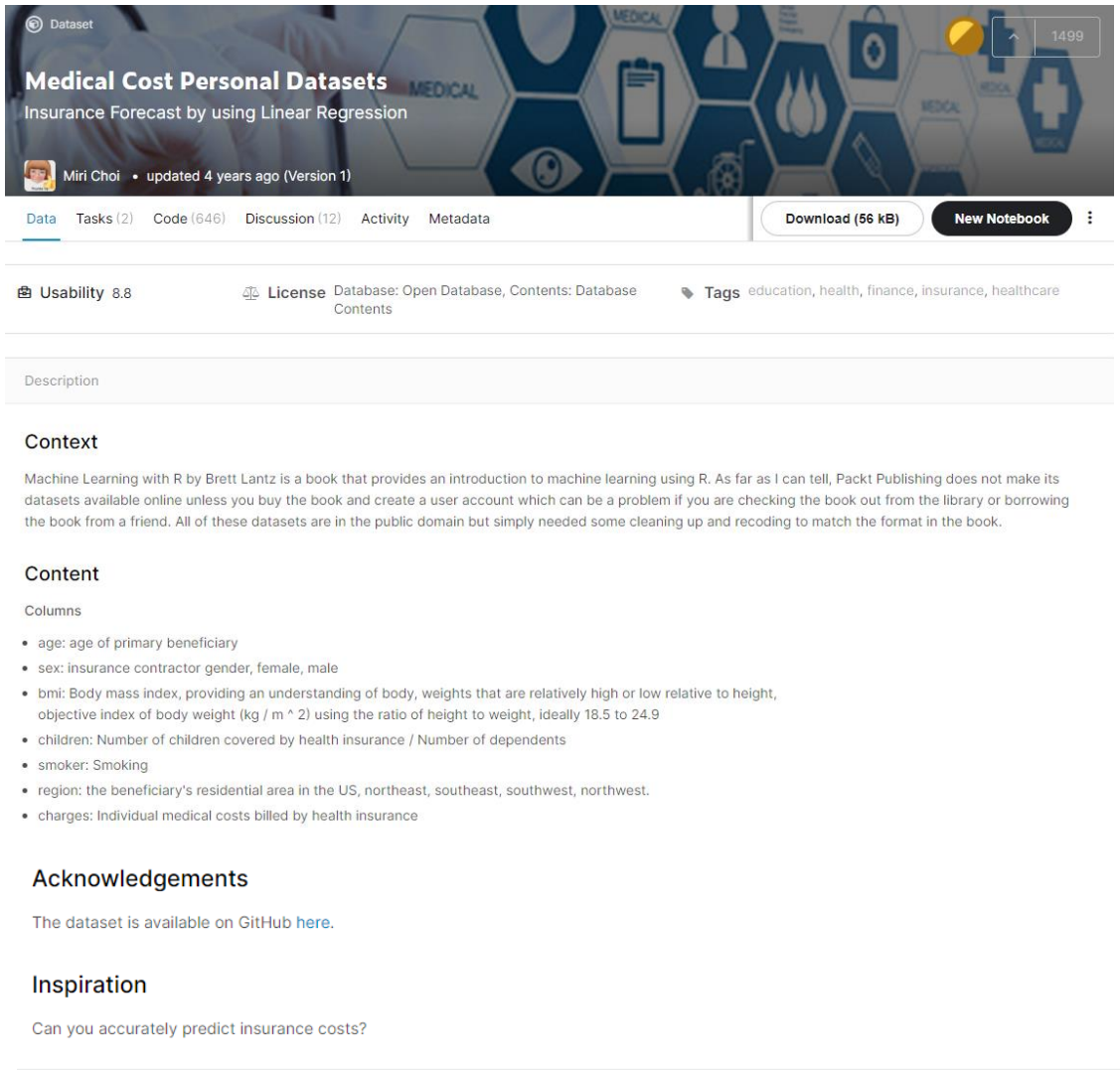
#1 주제

여러 요인에 따라 달라지는 치료비용 예측



#1 사용한 데이터



의료비 개인 데이터 세트
(선형회귀를 통한 보험료 예측)

컬럼

- 나이
- 성별(남,여)
- Bmi(체질량 지수 – 정상:18.5~24.9)
- 자녀(자녀의 수)
- 지역(미국)
- 흡연(흡연자,비흡연자)
- 비용(개인 의료비)

#2 데이터 읽어오기

```
import numpy as np
import pandas as pd
import os
import matplotlib.pyplot as pl
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
data = pd.read_csv('../input/insurance.csv')
```

모듈 import
데이터 읽어 오기

```
data.head(10)
```

	age	sex	bmi	children	smoker	region	charges
0	19	female	27.900	0	yes	southwest	16884.92400
1	18	male	33.770	1	no	southeast	1725.55230
2	28	male	33.000	3	no	southeast	4449.46200
3	33	male	22.705	0	no	northwest	21984.47061
4	32	male	28.880	0	no	northwest	3866.85520
5	31	female	25.740	0	no	southeast	3756.62160
6	46	female	33.440	1	no	southeast	8240.58960
7	37	female	27.740	3	no	northwest	7281.50560
8	37	male	29.830	2	no	northeast	6406.41070
9	60	female	25.840	0	no	northwest	28923.13692

상위 10개 데이터

[labelEncoder] 을 사용하여
성별, 흡연여부,지역과 같은
데이터를 수치로 바꿔준다.

```
from sklearn.preprocessing import LabelEncoder
#sex
le = LabelEncoder()
le.fit(data.sex.drop_duplicates())
data.sex = le.transform(data.sex)
# smoker or not
le.fit(data.smoker.drop_duplicates())
data.smoker = le.transform(data.smoker)
#region
le.fit(data.region.drop_duplicates())
data.region = le.transform(data.region)
```

+ Code + Markdown

```
print(data.region[:10])
print(le.classes_)
```

```
0    3
1    2
2    2
3    1
4    1
5    2
6    2
7    1
8    0
9    1
Name: region, dtype: int64
['northeast' 'northwest' 'southeast' 'southwest']
```

```
print(data.smoker[:10])
```

```
0    1
1    0
2    0
3    0
4    0
5    0
6    0
7    0
8    0
9    0
Name: smoker, dtype: int64
```

흡연자

비흡연자

```
print(data.sex[:10])
```

```
0    0
1    1
2    1
3    1
4    1
5    0
6    0
7    0
8    1
9    0
Name: sex, dtype: int64
```

여성

남성

#3 읽어온 데이터 표시-히트맵

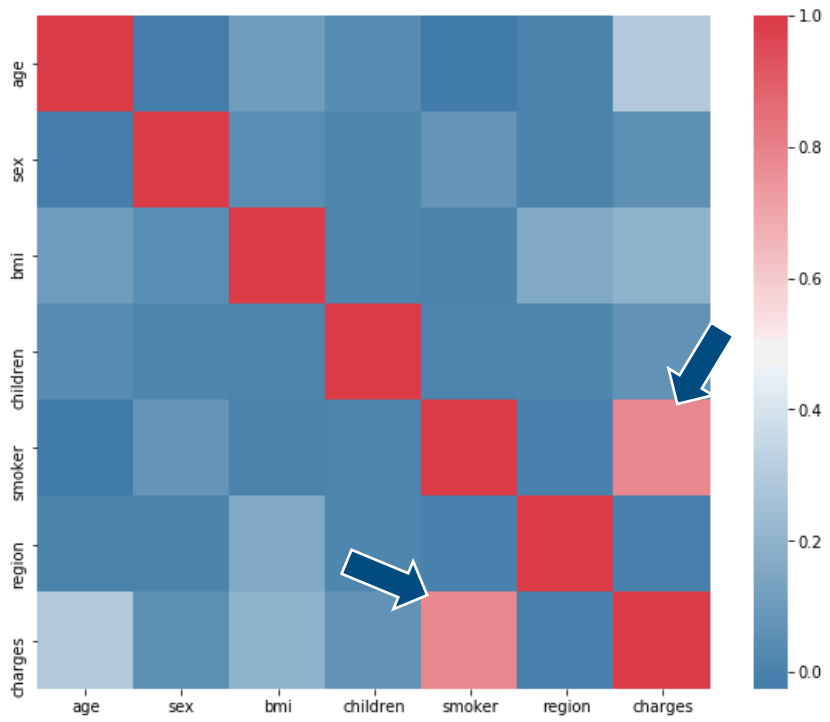
```
data.isnull().sum()
```

```
age         0
sex         0
bmi         0
children    0
smoker      0
region      0
charges     0
dtype: int64
```

널값이 있는지 확인

```
f, ax = pl.subplots(figsize=(10, 8))
corr = data.corr()
sns.heatmap(corr, mask=np.zeros_like(corr, dtype=np.bool), cmap=sns.diverging_palette(240,10,as_cmap=True),
            square=True, ax=ax)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f23bcb9ea20>
```

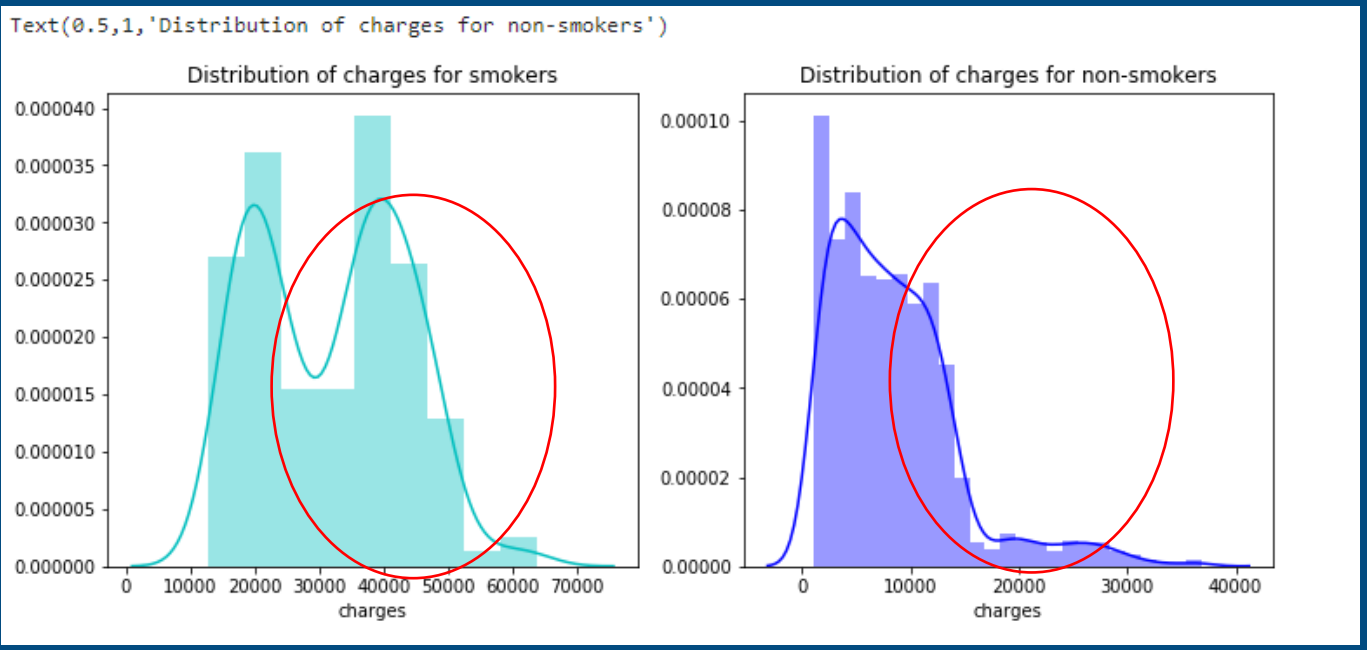


흡연자가 상관관계가
높은 것을 볼 수 있다

#3 읽어온 데이터 표시-히스토그램

```
from bokeh.io import output_notebook, show
from bokeh.plotting import figure
output_notebook()
import scipy.special
from bokeh.layouts import gridplot
from bokeh.plotting import figure, show, output_file

f= pl.figure(figsize=(12,5))

ax=f.add_subplot(121)
sns.distplot(data[(data.smoker == 1)]["charges"],color='c',ax=ax)
ax.set_title('Distribution of charges for smokers')

ax=f.add_subplot(122)
sns.distplot(data[(data.smoker == 0)]['charges'],color='b',ax=ax)
ax.set_title('Distribution of charges for non-smokers')
```

```
Text(0.5,1,'Distribution of charges for non-smokers')
```



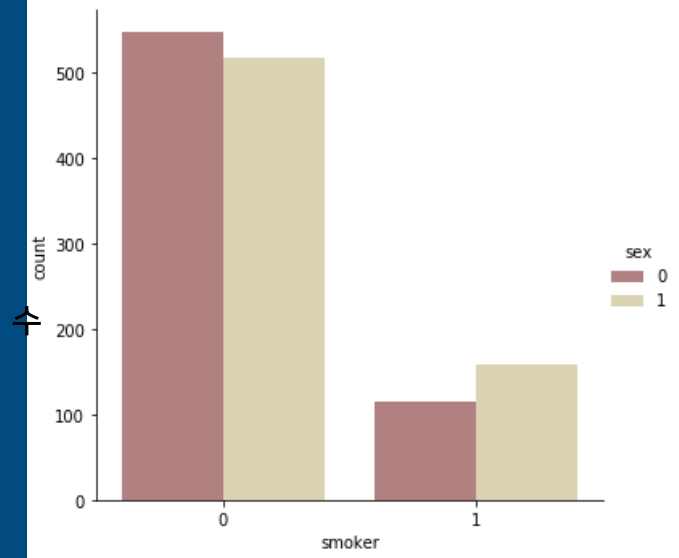
흡연자 vs 비흡연자

흡연자중에 의료비용이 높은 사람이 많다

#3 읽어온 데이터 표시-catplot , violin

```
sns.catplot(x="smoker", kind="count",hue = 'sex', palette="pink", data=data)
```

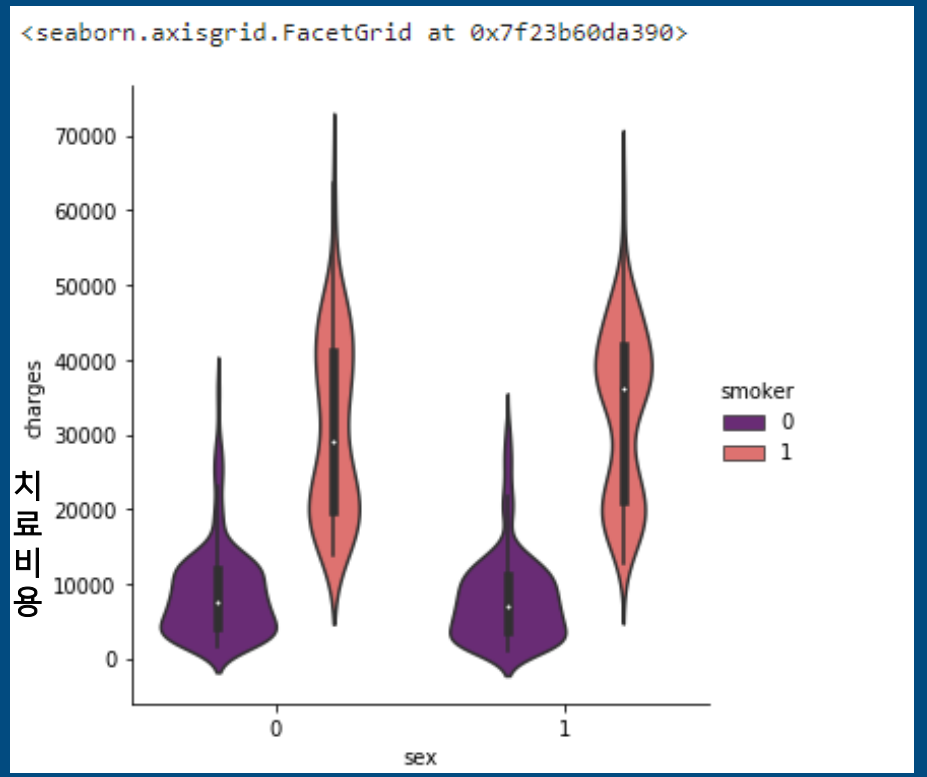
```
<seaborn.axisgrid.FacetGrid at 0x7f23bd9246d8>
```



여성:0
남성:1

<성별에 따른 흡연자>
여성보다 남성흡연자의수가 많다

```
<seaborn.axisgrid.FacetGrid at 0x7f23b60da390>
```

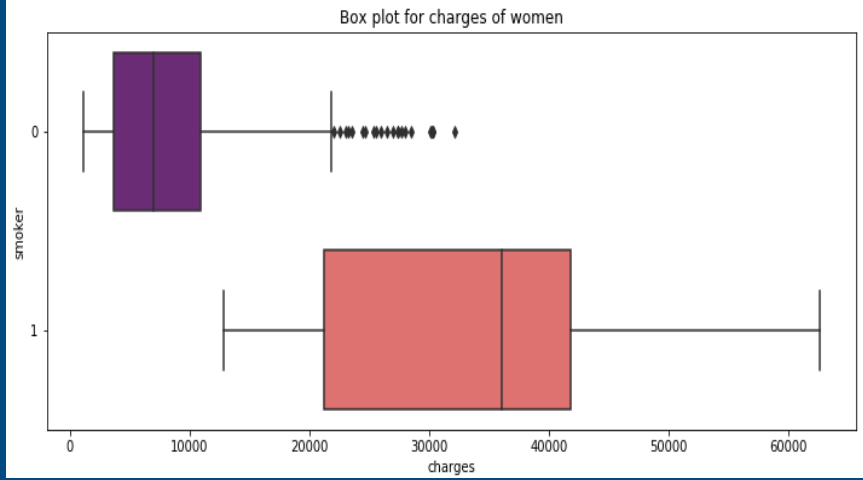


흡연자가 치료비용이 더 높다

#3 읽어온 데이터 표시-boxplot

```
pl.figure(figsize=(12,5))
pl.title("Box plot for charges of women")
sns.boxplot(y="smoker", x="charges", data =  data[(data.sex == 1)] , orient="h", palette = 'magma')
```

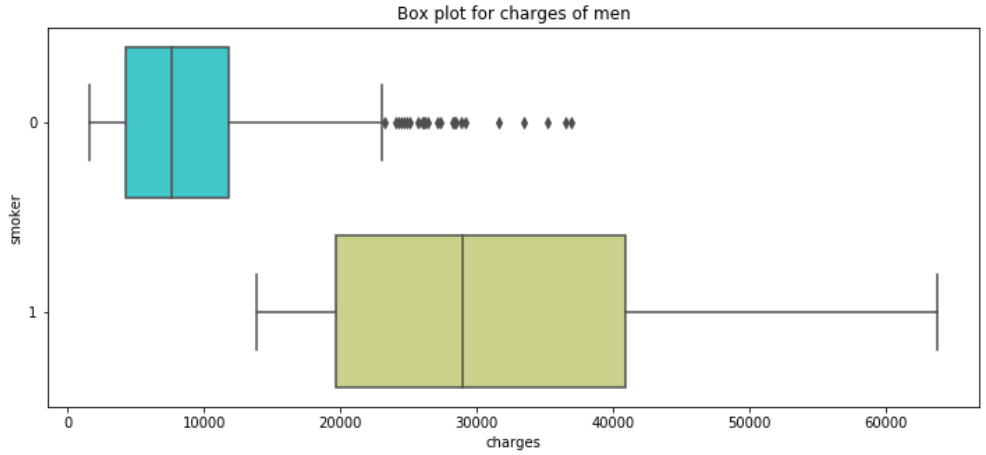
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f23b6069c18>
```



<여성>

```
pl.figure(figsize=(12,5))
pl.title("Box plot for charges of men")
sns.boxplot(y="smoker", x="charges", data =  data[(data.sex == 0)] , orient="h", palette = 'rainbow')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f23b5ff10b8>
```



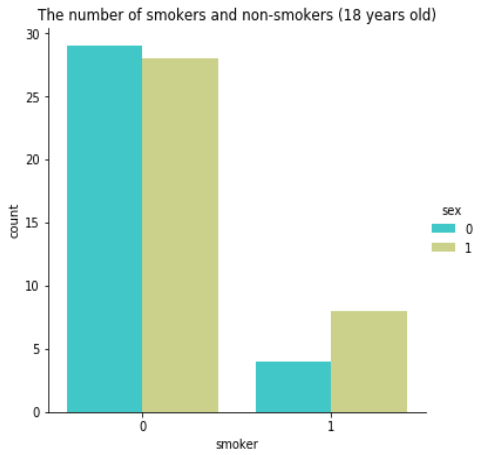
<남성>

둘 다 흡연자의 의료 비용의 평균이 더 높다

#3 18세의 데이터

```
sns.catplot(x="smoker", kind="count",hue = 'sex', palette="rainbow", data=data[(data.age == 18)])
pl.title("The number of smokers and non-smokers (18 years old)")
```

```
Text(0.5,1,'The number of smokers and non-smokers (18 years old)')
```

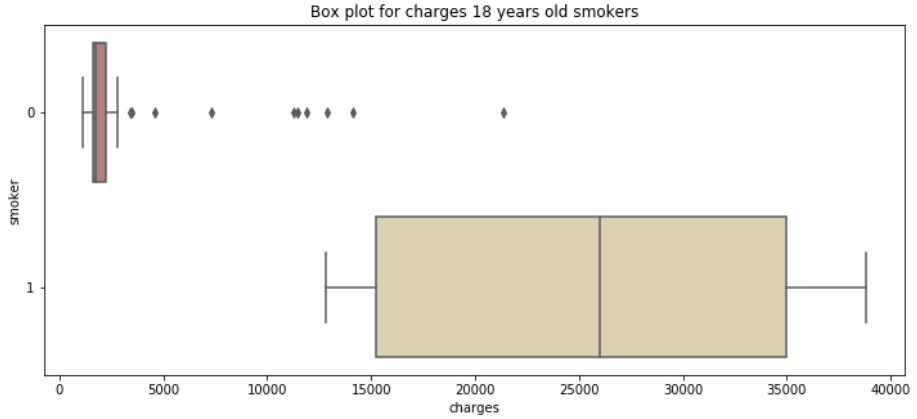


18살 흡연자의 비

⇨ 성인과 비슷

```
pl.figure(figsize=(12,5))
pl.title("Box plot for charges 18 years old smokers")
sns.boxplot(y="smoker", x="charges", data = data[(data.age == 18)] , orient="h", palette = 'pink')
```

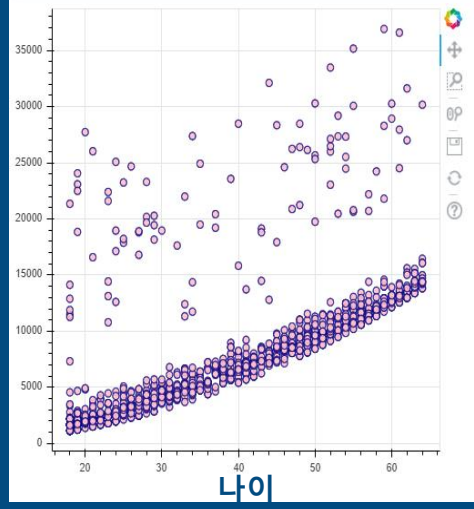
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f23b5fd8080>
```



흡연자와 비흡연장의
의료비용 차이가 크다

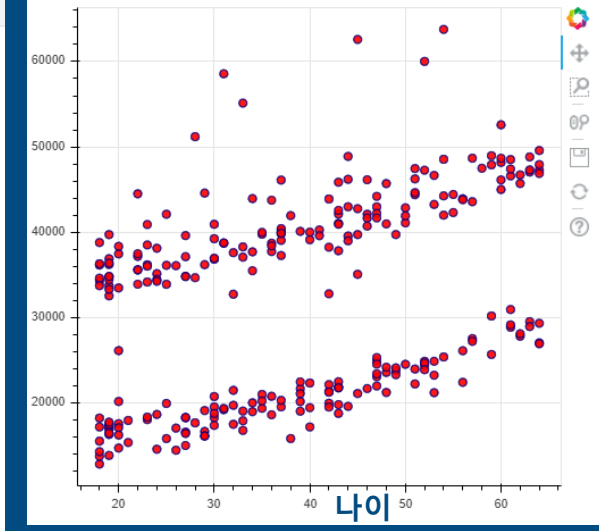
#3 비흡연자 vs 흡연자 – 나이에 따른 의료비용

```
#non - smokers
p = figure(plot_width=500, plot_height=450)
p.circle(x=data[(data.smoker == 0)].age,y=data[(data.smoker == 0)].charges, size=7, line_color="navy", fill_color="pink", fill_alpha=0.9)

show(p)
```



<비흡연자>

```
#smokers
p = figure(plot_width=500, plot_height=450)
p.circle(x=data[(data.smoker == 1)].age,y=data[(data.smoker == 1)].charges, size=7, line_color="navy", fill_color="red", fill_alpha=0.9)
show(p)
```



<흡연자>

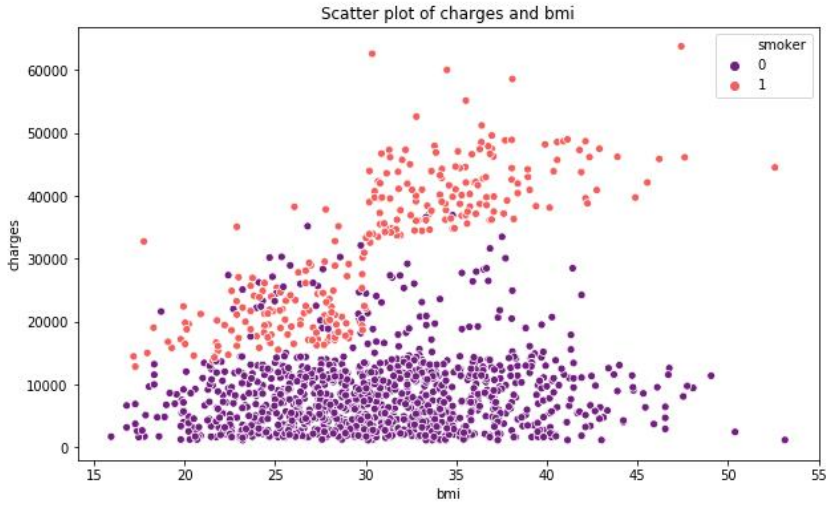
둘 다 나이에 따라 의료비용 증가

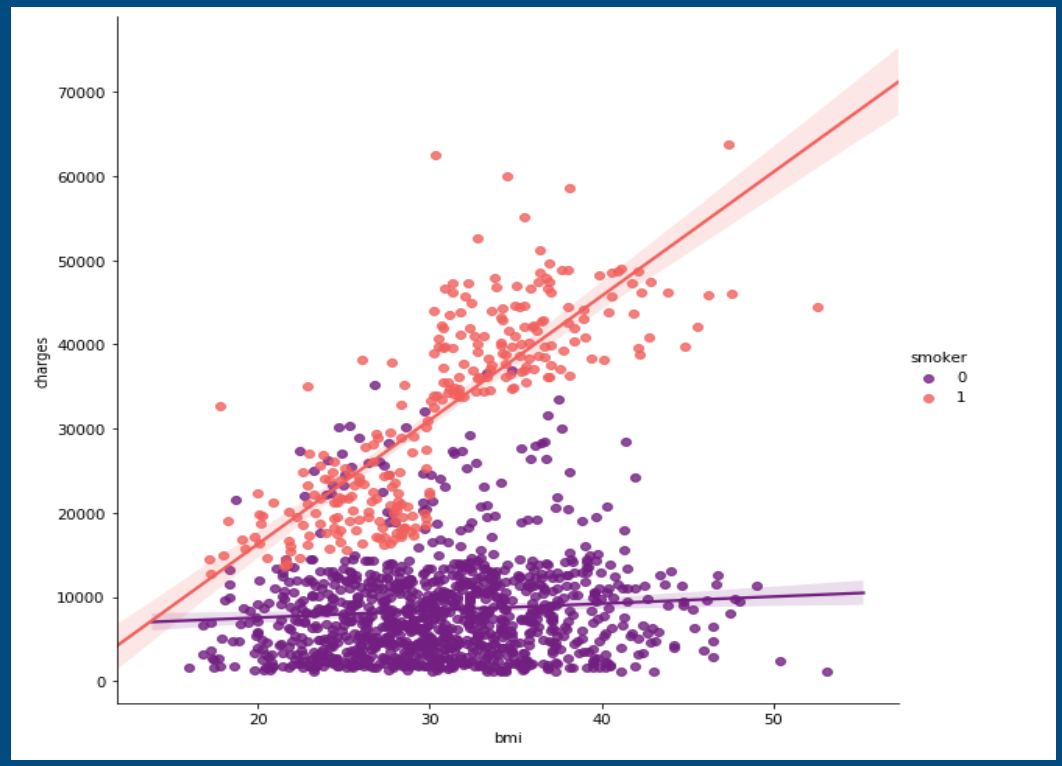
흡연자가 의료비용 더 높음

#3 Bmi(체질량 지수) 에 따른 의료 비용

```
pl.figure(figsize=(10,6))
ax = sns.scatterplot(x='bmi',y='charges',data=data,palette='magma',hue='smoker')
ax.set_title('Scatter plot of charges and bmi')

sns.lmplot(x="bmi", y="charges", hue="smoker", data=data, palette = 'magma', size = 8)
```

```
<seaborn.axisgrid.FacetGrid at 0x7f23b5844f98>
```





Bmi보다는 흡연여부가
더 큰 영향을 미침

#4 학습 및 테스트(LinearRegression)

```
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import PolynomialFeatures
from sklearn.metrics import r2_score,mean_squared_error
from sklearn.ensemble import RandomForestRegressor
```

```
x = data.drop(['charges'], axis = 1)      #문제부분
y = data.charges                          #답부분

x_train,x_test,y_train,y_test = train_test_split(x,y, random_state = 0)
lr = LinearRegression().fit(x_train,y_train)  #학습

y_train_pred = lr.predict(x_train)
y_test_pred = lr.predict(x_test)

print(lr.score(x_test,y_test))
```

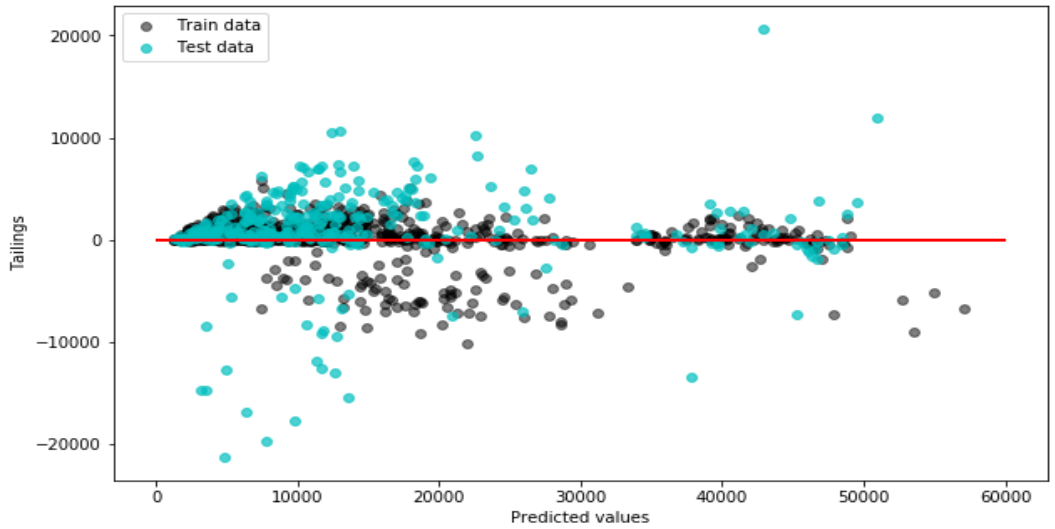
```
0.7962732059725786      #점수
```

#4 학습 및 테스트(RandomForestRegressor)

```
RF = RandomForestRegressor(random_state = 0)
RF.fit(x_train,y_train)                    #학습

score = RF.score(x_train,y_train)
print('Score:', format(score,'.3f'))


pred = RF.predict(x_test)
print('Predicted:', pred)
print('Correct answer:\n', y_test)
```

```
Score: 0.964      #점수
```

```
pl.figure(figsize=(10,6))

pl.scatter(forest_train_pred,forest_train_pred - y_train,
          c = 'black', marker = 'o', s = 35, alpha = 0.5,
          label = 'Train data')
pl.scatter(forest_test_pred,forest_test_pred - y_test,
          c = 'c', marker = 'o', s = 35, alpha = 0.7,
          label = 'Test data')
pl.xlabel('Predicted values')
pl.ylabel('Tailings')
pl.legend(loc = 'upper left')
pl.hlines(y = 0, xmin = 0, xmax = 60000, lw = 2, color = 'red')
pl.show()
```



학습용데이터와 테스트데이터가 거의 비슷하다

감사합니다.