Naive Bayes Classifier for numeric data

```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
from sklearn.datasets import load_breast_cancer
#from sklearn.metrics import confusion_matrix
from sklearn.naive_bayes import GaussianNB
from sklearn.model_selection import train_test_split
import seaborn as sns
sns.set()
```

```
br = load_breast_cancer()
X = pd.DataFrame(br.data, columns=br.feature_names)
#X = X[['mean area', 'mean compactness']]
y = pd.Categorical.from_codes(br.target, br.target_names)
y = pd.get_dummies(y, drop_first=False)
```

```
#Y=np.array(y['setosa'])+2*np.array(y['versicolor'])+3*np.array(y['virginica'])
#Y
y_b=y['benign']
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y_b, test_size=0.1,random_state=1)
```

```
nu_nb = GaussianNB()
nu_nb.fit(X_train, y_train)
```

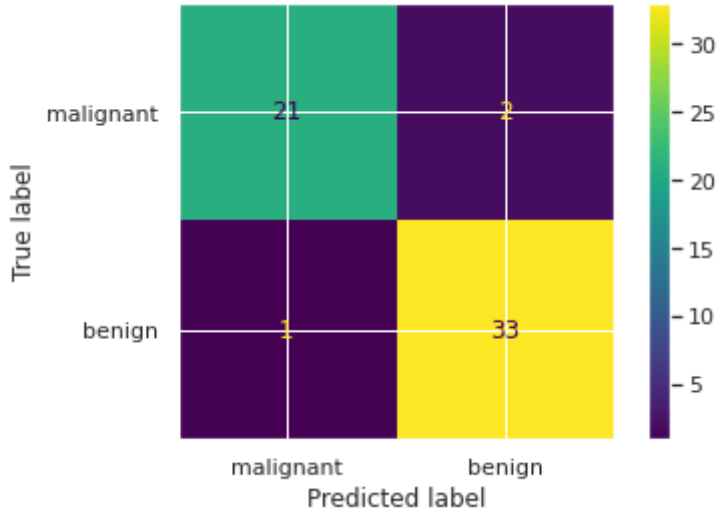
```
GaussianNB(priors=None, var_smoothing=1e-09)
```

```
y_pred=nu_nb.predict(X_test)
```

Confusion matrix

```
from sklearn.metrics import plot_confusion_matrix
plot_confusion_matrix(nu_nb, X_test, y_test,
                                  display_labels=br.target_names)
```

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7fc55aca4748>
```



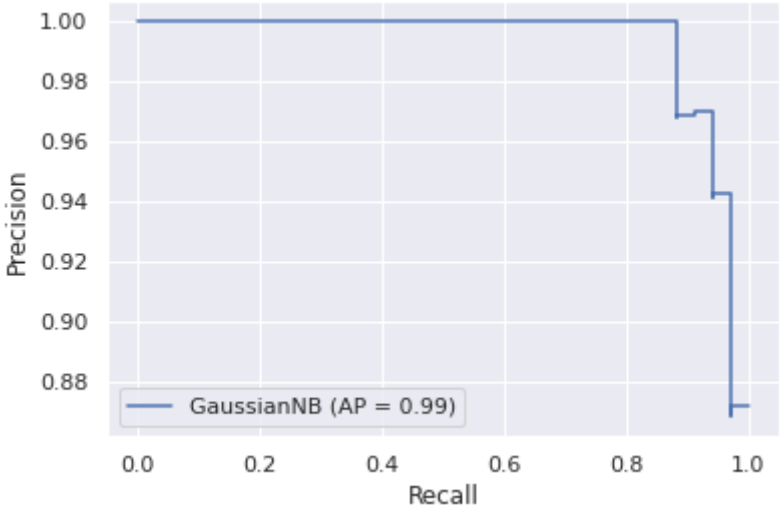
Precision Recall curve

```
from sklearn.metrics import plot_precision_recall_curve
from sklearn.metrics import precision_recall_curve
from sklearn.metrics import average_precision_score
from sklearn.metrics import precision_recall_fscore_support

plot_precision_recall_curve(nu_nb,X_test,y_test)

v=precision_recall_fscore_support(y_test,y_pred)
print("For malignant cancers: precision="+str(v[0][0])+" recall="+str(v[1][0]))
print("For benign cancers: precision="+str(v[0][1])+" recall="+str(v[1][1]))
```

```
For malignant cancers: precision=0.9545454545454546 recall=0.9130434782608695
For benign cancers: precision=0.9428571428571428 recall=0.9705882352941176
```




```
1 print("Accuracy for predicting benign or malignant cancer:"+str(accuracy_score(y_test,y_pred)))
```

```
Accuracy for predicting benign or malignant cancer:0.9479768786127167
```

Naive Bayes Classifier for nominal data

```
1 from google.colab import drive
2 drive.mount("/content/drive")
```

```
Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6qk8qdgf4n4g3pfee6491hc0brc4i.

Enter your authorization code:
··········
Mounted at /content/drive
```

```
df=pd.read_csv("/content/drive/My Drive/car_acc.csv")
df
```

	buying	maint	doors	persons	lug_boot	safety	acc
0	vhigh	vhigh	2	2	small	low	0
1	vhigh	vhigh	2	2	small	med	0
2	vhigh	vhigh	2	2	small	high	0
3	vhigh	vhigh	2	2	med	low	0
4	vhigh	vhigh	2	2	med	med	0
...	...	...	...	...	...	...	...
1723	low	low	5more	more	med	med	1
1724	low	low	5more	more	med	high	1
1725	low	low	5more	more	big	low	0
1726	low	low	5more	more	big	med	1
1727	low	low	5more	more	big	high	1

1728 rows × 7 columns

```
X=df[df.columns[0:6]]
Y=df[df.columns[6]]

X=pd.get_dummies(X)
```

```
from sklearn.naive_bayes import CategoricalNB
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size=0.1,random_state=1)
```

```
cat_nb = CategoricalNB()
cat_nb.fit(X_train, y_train)
```

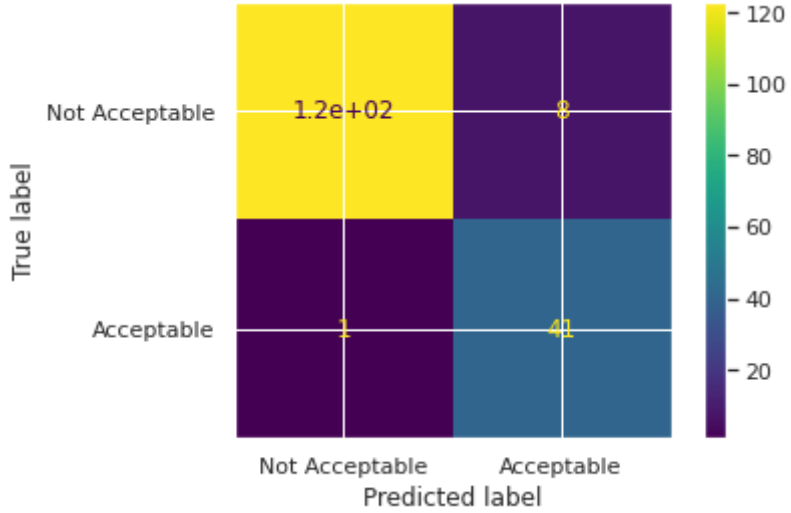
```
CategoricalNB(alpha=1.0, class_prior=None, fit_prior=True)
```

```
y_pred=cat_nb.predict(X_test)
```

Confusion matrix

```
from sklearn.metrics import plot_confusion_matrix
plot_confusion_matrix(cat_nb, X_test, y_test,
                                  display_labels=["Not Acceptable",'Acceptable'])
```

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7fc55a077978>
```



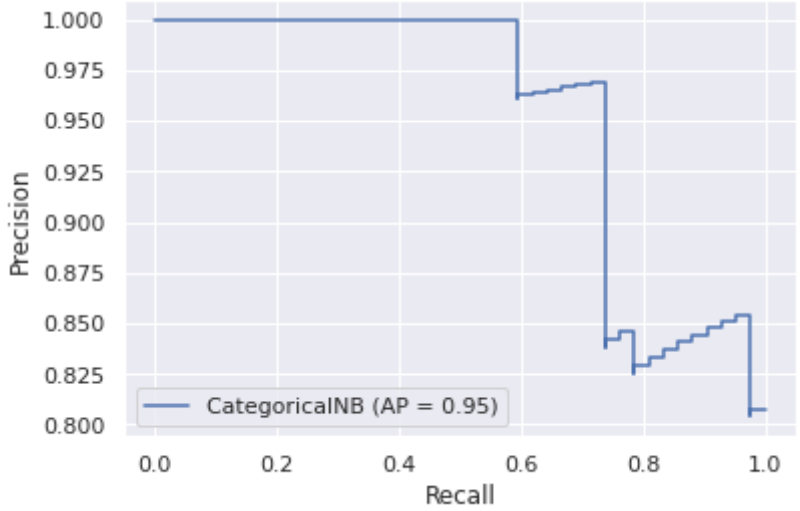
Precision Recall curve

```
from sklearn.metrics import plot_precision_recall_curve
from sklearn.metrics import precision_recall_curve
from sklearn.metrics import average_precision_score
from sklearn.metrics import precision_recall_fscore_support

plot_precision_recall_curve(cat_nb,X_test,y_test)
```

```
7
8 v=precision_recall_fscore_support(y_test,y_pred)
9 print("For not acceptable cars: precision="+str(v[0][0])+" recall="+str(v[1][0]))
10 print("For acceptable cars: precision="+str(v[0][1])+" recall="+str(v[1][1]))
```

```
For not acceptable cars: precision=0.9919354838709677 recall=0.9389312977099237
For acceptable cars: precision=0.8367346938775511 recall=0.9761904761904762
```




```
1 print("Accuracy for predicting not acceptable or acceptable car:"+str(accuracy_score(y_test,y_pred)))
```

```
Accuracy for predicting not acceptable or acceptable car:0.9479768786127167
```