Práctica 4. Naive Bayes

Dataset: Fertility

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sb
import sklearn
from sklearn.naive_bayes import BernoulliNB,GaussianNB,MultinomialNB
from mixed_naive_bayes import MixedNB
from sklearn.model_selection import train_test_split
from sklearn import metrics
from sklearn.metrics import accuracy_score
from sklearn import preprocessing
```

In [2]:
```
fertility = pd.read_csv("Fertility1.csv", sep=";")
tamaño=.30
tamañoTest=len(fertility)*tamaño
fertility.head(3)
```

Out[2]:

	season	age	Ch_Disease	Accident	Surg_Int	H_Fever	Alcohol_Cons	Smoke	N_Hours	Diag
0	Fall	30	No	Yes	Yes	Greater th 3m	Once a week	Daily	6	Altered
1	Winter	31	No	Yes	No	No	Several times a week	Occasional	9	Normal
2	Winter	29	No	Yes	No	Greater th 3m	Hardly ever or never	Occasional	3	Normal

In [3]:
```
le = preprocessing.LabelEncoder()

num = fertility.select_dtypes(include=np.number)
nonum = fertility.select_dtypes(exclude=np.number)
nonum = nonum.drop(["Diag"], axis=1)
for columna in nonum:
    nonum[columna + "_cod"]=le.fit_transform(nonum.loc[:, columna])
    nonum = nonum.drop(columna, axis=1)
nonum.head(3)
```

Out[3]:

	season_cod	Ch_Disease_cod	Accident_cod	Surg_Int_cod	H_Fever_cod	Alcohol_Cons_cod	Smoke_cod
0	0	0	1	1	0	2	0
1	3	0	1	0	2	4	2
2	3	0	1	0	0	1	2

In [4]:
```
X = pd.concat([num,nonum], axis=1)
y = fertility.loc[:,fertility.columns=="Diag"]

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=tamaño, random_state=0, stratify=y)
y_expect = y_test
```

Bernoulli Naive Bayes

In [5]:
```
BernNB = BernoulliNB(binarize = 0.1)
BernNB.fit(X_train, y_train)
y_pred = BernNB.predict(X_test)
B = accuracy_score(y_expect, y_pred)
Bn = tamañoTest - accuracy_score(y_expect, y_pred, normalize=False)

y_expect= y_expect["Diag"].to_numpy()
valores= [y_expect, y_pred]
tabla = pd.DataFrame(data=valores, index=["Esperado","Estimado"])
tabla= tabla.transpose()
tabla
frecuente=tabla["Esperado"].mode()
frecuente=str(frecuente[0])
def diferente(val):
    yellow = 'background-color: yellow'if val != frecuente else ""
    return yellow
tabla.style.applymap(diferente)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:72: DataConversionWarning: A column-vector y was
passed when a 1d array was expected. Please change the shape of y to (n_samples, ), for example using ravel().
  return f(**kwargs)
```

Out[5]:

	Esperado	Estimado
0	Normal	Normal
1	Normal	Normal
2	Normal	Normal
3	Normal	Normal
4	Normal	Normal
5	Normal	Normal
6	Altered	Normal
7	Altered	Normal
8	Normal	Normal
9	Normal	Normal
10	Normal	Normal
11	Normal	Normal
12	Normal	Normal
13	Normal	Normal
14	Normal	Normal
15	Normal	Normal
16	Normal	Normal
17	Normal	Normal
18	Normal	Normal
19	Normal	Normal
20	Normal	Normal
21	Normal	Normal
22	Normal	Normal
23	Normal	Normal
24	Altered	Normal
25	Normal	Normal
26	Altered	Normal
27	Normal	Normal
28	Normal	Normal
29	Normal	Normal

Multinomial Naive Bayes

In [6]:
```
MultiNB = MultinomialNB()
MultiNB.fit(X_train, y_train)
y_pred = MultiNB.predict(X_test)
M = accuracy_score(y_expect, y_pred)
Mn = tamañoTest - accuracy_score(y_expect, y_pred, normalize=False)
#print(accuracy_score(y_expect, y_predM))
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:72: DataConversionWarning: A column-vector y was
passed when a 1d array was expected. Please change the shape of y to (n_samples, ), for example using ravel().
  return f(**kwargs)
```

Gaussian Naive Bayes

In [7]:
```
GaussNB=GaussianNB()
GaussNB.fit(X_train, y_train)
y_pred = GaussNB.predict(X_test)
G = accuracy_score(y_expect, y_pred)
Gn = tamañoTest - accuracy_score(y_expect, y_pred, normalize=False)
#print(accuracy_score(y_expect,y_predG))
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:72: DataConversionWarning: A column-vector y was
passed when a 1d array was expected. Please change the shape of y to (n_samples, ), for example using ravel().
  return f(**kwargs)
```

Mixed Naive Bayes

In [8]:
```
yCod = le.fit_transform(fertility.loc[:, "Diag"])
#tamaño=.20
X_train, X_test, y_train, y_test = train_test_split(X, yCod, test_size=tamaño, random_state=0, stratify=yCod)
y_expect = y_test
```

In [9]:
```
MixtoNB = MixedNB(categorical_features=[2, 3, 4, 5, 6, 7, 8])
MixtoNB.fit(X_train,y_train)
y_pred = MixtoNB.predict(X_test)
Mix =accuracy_score(y_test, y_pred)
MixG = tamañoTest - accuracy_score(y_expect, y_pred, normalize=False)
```

In [10]:
```
#y_expect= y_expect["Diag_cod"].to_numpy()
valores= [y_test, y_pred]
tabla = pd.DataFrame(data=valores, index=["Esperado","Estimado"])
tabla= tabla.transpose()
tabla
#frecuente=tabla["Esperado"].mode()
#frecuente=str(frecuente[0])
def diferente(val):
    yellow = 'background-color: yellow' if val == 0 else ""
    return yellow
tabla.style.applymap(diferente)
```

Out[10]:

	Esperado	Estimado
0	1	1
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	0	1
7	0	1
8	1	1
9	1	1
10	1	1
11	1	1
12	1	1
13	1	1
14	1	1
15	1	1
16	1	1
17	1	1
18	1	1
19	1	1
20	1	1
21	1	1
22	1	1
23	1	1
24	0	0
25	1	1
26	0	1
27	1	1
28	1	1
29	1	1

In [11]:
```
cabeceras= ["BernoulliNB","MultinomialNB","GaussianNB","MixedNB"]
valores= [[B,Bn],[M,Mn],[G,Gn],[Mix,MixG]]
tabla = pd.DataFrame(data=valores, index=cabeceras, columns = ["% Aciertos", "No Achuntes"])
```

Resumen

In [12]:
```
print("Con una proporción de muestra de: ", tamaño*100, "%")
tabla.sort_values(by="% Aciertos", ascending= False)
```

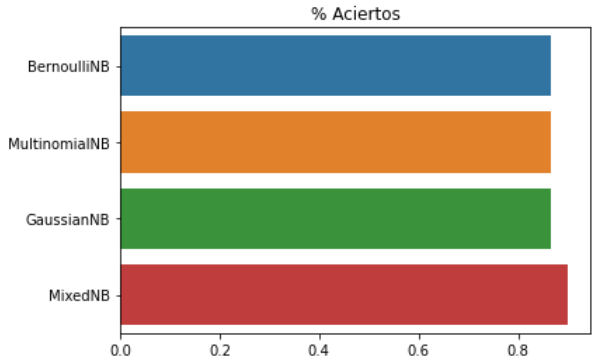
```
Con una proporción de muestra de:  30.0 %
```

Out[12]:

	% Aciertos	No Achuntes
MixedNB	0.900000	3.0
BernoulliNB	0.866667	4.0
MultinomialNB	0.866667	4.0
GaussianNB	0.866667	4.0

In [13]:
```
sb.barplot(y=cabeceras, x="% Aciertos", data=tabla, orient = 'h').set(title='% Aciertos',xlabel=None)
```

Out[13]:
```
[Text(0.5, 1.0, '% Aciertos'), Text(0.5, 0, '')]
```



In [ ]: