In [1]:
```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen

Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving salary.csv to salary.csv
```

In [2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.preprocessing import LabelEncoder
```

```
/usr/local/lib/python3.6/dist-packages/statsmodels/tools/_testing.py:19: FutureWarning: pandas.util.testing is deprecat
ed. Use the functions in the public API at pandas.testing instead.
  import pandas.util.testing as tm
```

In [3]:
```
df = pd.read_csv("salary.csv")
d = pd.read_csv("salary.csv")
```

In [4]:
```
df
```

Out[4]:

	Unnamed: 0	age	Workclass	fnlwgt	education	education-num	marital-status	occupation	relationship	race	sex	capital-gain	capital-loss	hours-per-week	nat cou
0	0	39	State-gov	77516	Bachelors	13	Never-married	Adm-clerical	Not-in-family	White	Male	2174	0	40	Uni St
1	1	50	Self-emp-not-inc	83311	Bachelors	13	Married-civ-spouse	Exec-managerial	Husband	White	Male	0	0	13	Uni St
2	2	38	Private	215646	HS-grad	9	Divorced	Handlers-cleaners	Not-in-family	White	Male	0	0	40	Uni St
3	3	53	Private	234721	11th	7	Married-civ-spouse	Handlers-cleaners	Husband	Black	Male	0	0	40	Uni St
4	4	28	Private	338409	Bachelors	13	Married-civ-spouse	Prof-specialty	Wife	Black	Female	0	0	40	C
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
1027	1114	34	Private	290763	HS-grad	9	Divorced	Handlers-cleaners	Own-child	White	Female	0	0	40	Uni St
1028	1116	36	Private	51100	Some-college	10	Married-civ-spouse	Craft-repair	Husband	White	Male	0	0	40	Uni St
1029	1117	41	Private	227644	HS-grad	9	Married-civ-spouse	Transport-moving	Husband	White	Male	0	0	50	Uni St
1030	1118	58	Local-gov	205267	Bachelors	13	Married-civ-spouse	Prof-specialty	Wife	White	Female	0	0	40	Uni St
1031	1119	53	Private	288020	Bachelors	13	Married-civ-spouse	Prof-specialty	Husband	Asian-Pac-Islander	Male	0	0	40	Ja

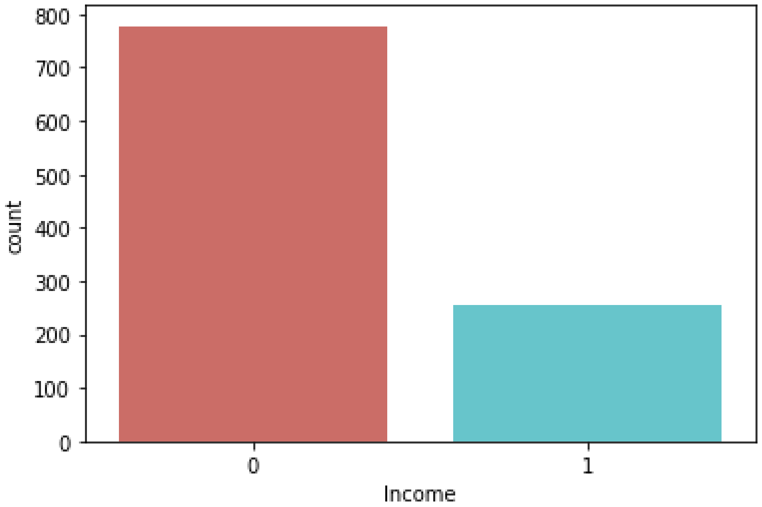
1032 rows × 16 columns

In [5]:
```
df.drop(["Unnamed: 0"], axis=1,inplace = True)
```

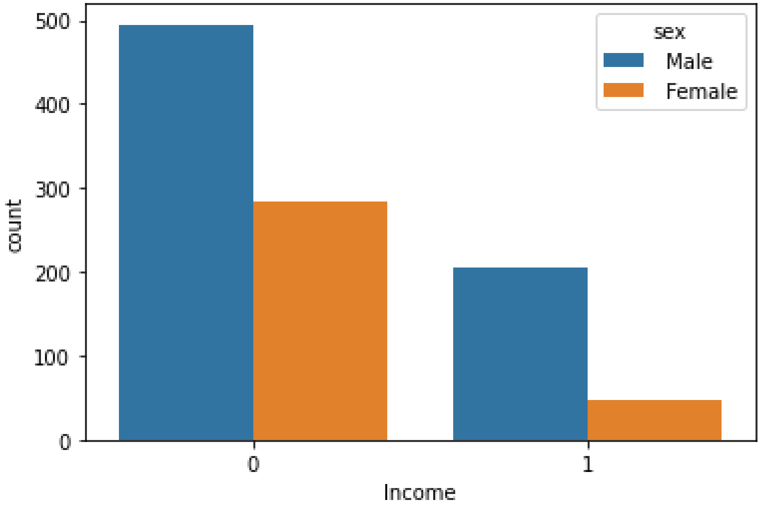
In [6]:
```
df["Income"].value_counts()
```

Out[6]:
```
0    778
1    254
Name: Income, dtype: int64
```

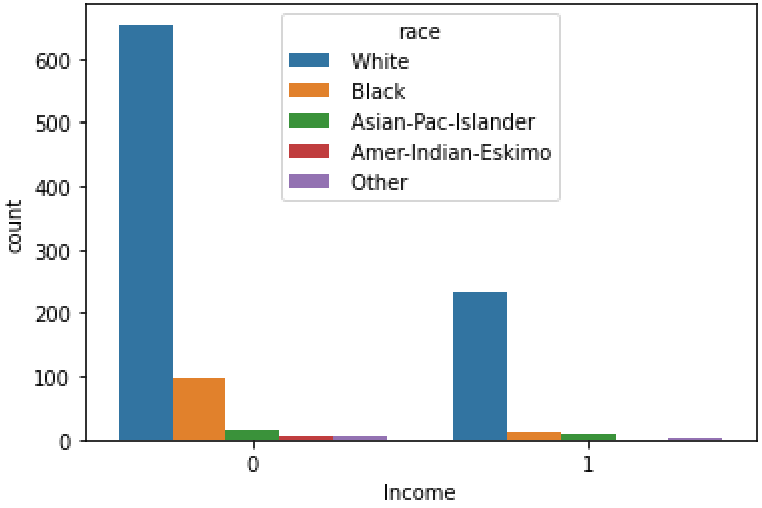
In [7]:
```
sns.countplot(x='Income',data=df, palette='hls')
plt.show()
```



In [8]:
```
plt.figure()
sns.countplot(data=df,x="Income",hue="sex")
plt.show()
```



In [9]:
```
plt.figure()
sns.countplot(data=df,x="Income",hue="race")
plt.show()
```



#To Check Missing Value:-

In [10]:
```
df.isnull().sum()
```

Out[10]:
```
age               0
Workclass         0
fnlwgt            0
education         0
education-num     0
marital-status    0
occupation        0
relationship      0
race              0
sex               0
capital-gain      0
capital-loss      0
hours-per-week    0
native-country    0
Income            0
dtype: int64
```

Data Type :

In [37]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1032 entries, 0 to 1031
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Workclass       1032 non-null   int64
 1   education       1032 non-null   int64
 2   marital-status  1032 non-null   int64
 3   occupation      1032 non-null   int64
 4   relationship    1032 non-null   int64
 5   race            1032 non-null   int64
 6   sex             1032 non-null   int64
 7   native-country  1032 non-null   int64
 8   age             1032 non-null   int64
 9   fnlwgt          1032 non-null   int64
 10  education-num   1032 non-null   int64
 11  capital-gain    1032 non-null   int64
 12  capital-loss    1032 non-null   int64
 13  hours-per-week  1032 non-null   int64
 14  Income          1032 non-null   int64
dtypes: int64(15)
memory usage: 121.1 KB
```

In [12]:
```
df_num = df.select_dtypes(["float64","int64"])
```

In [13]:
```
df_num
```

Out[13]:

	age	fnlwgt	education-num	capital-gain	capital-loss	hours-per-week	Income
0	39	77516	13	2174	0	40	0
1	50	83311	13	0	0	13	0
2	38	215646	9	0	0	40	0
3	53	234721	7	0	0	40	0
4	28	338409	13	0	0	40	0
...	...	...	...	...	...	...	...
1027	34	290763	9	0	0	40	0
1028	36	51100	10	0	0	40	0
1029	41	227644	9	0	0	50	0
1030	58	205267	13	0	0	40	1
1031	53	288020	13	0	0	40	0

1032 rows × 7 columns

In [14]:
```
df_cat = df.select_dtypes(object)
```

In [15]:
```
df_cat
```

Out[15]:

	Workclass	education	marital-status	occupation	relationship	race	sex	native-country
0	State-gov	Bachelors	Never-married	Adm-clerical	Not-in-family	White	Male	United-States
1	Self-emp-not-inc	Bachelors	Married-civ-spouse	Exec-managerial	Husband	White	Male	United-States
2	Private	HS-grad	Divorced	Handlers-cleaners	Not-in-family	White	Male	United-States
3	Private	11th	Married-civ-spouse	Handlers-cleaners	Husband	Black	Male	United-States
4	Private	Bachelors	Married-civ-spouse	Prof-specialty	Wife	Black	Female	Cuba
...	...	...	...	...	...	...	...	...
1027	Private	HS-grad	Divorced	Handlers-cleaners	Own-child	White	Female	United-States
1028	Private	Some-college	Married-civ-spouse	Craft-repair	Husband	White	Male	United-States
1029	Private	HS-grad	Married-civ-spouse	Transport-moving	Husband	White	Male	United-States
1030	Local-gov	Bachelors	Married-civ-spouse	Prof-specialty	Wife	White	Female	United-States
1031	Private	Bachelors	Married-civ-spouse	Prof-specialty	Husband	Asian-Pac-Islander	Male	Japan

1032 rows × 8 columns

In [16]:
```
le = LabelEncoder()
```

In [17]:
```
for col in df_cat:
  le = LabelEncoder()
  df_cat[col] = le.fit_transform(df_cat[col])
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a
-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
py)
  This is separate from the ipykernel package so we can avoid doing imports until
```

In [18]:
```
df_cat
```

Out[18]:

	Workclass	education	marital-status	occupation	relationship	race	sex	native-country
0	5	9	4	0	1	4	1	28
1	4	9	2	3	0	4	1	28
2	2	11	0	5	1	4	1	28
3	2	1	2	5	0	2	1	28
4	2	9	2	9	5	2	0	4
...	...	...	...	...	...	...	...	...
1027	2	11	0	5	3	4	0	28
1028	2	15	2	2	0	4	1	28
1029	2	11	2	13	0	4	1	28
1030	1	9	2	9	5	4	0	28
1031	2	9	2	9	0	1	1	18

1032 rows × 8 columns

In [19]:
```
df = pd.concat([df_cat,df_num],axis=1)
```

In [20]:
```
df
```

Out[20]:

	Workclass	education	marital-status	occupation	relationship	race	sex	native-country	age	fnlwgt	education-num	capital-gain	capital-loss	hours-per-week	Income
0	5	9	4	0	1	4	1	28	39	77516	13	2174	0	40	0
1	4	9	2	3	0	4	1	28	50	83311	13	0	0	13	0
2	2	11	0	5	1	4	1	28	38	215646	9	0	0	40	0
3	2	1	2	5	0	2	1	28	53	234721	7	0	0	40	0
4	2	9	2	9	5	2	0	4	28	338409	13	0	0	40	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1027	2	11	0	5	3	4	0	28	34	290763	9	0	0	40	0
1028	2	15	2	2	0	4	1	28	36	51100	10	0	0	40	0
1029	2	11	2	13	0	4	1	28	41	227644	9	0	0	50	0
1030	1	9	2	9	5	4	0	28	58	205267	13	0	0	40	1
1031	2	9	2	9	0	1	1	18	53	288020	13	0	0	40	0

1032 rows × 15 columns

In [21]:
```
X = df.iloc[:,:-1]
y = df.iloc[:,-1]
```

In [22]:
```
X.head()
```

Out[22]:

	Workclass	education	marital-status	occupation	relationship	race	sex	native-country	age	fnlwgt	education-num	capital-gain	capital-loss	hours-per-week
0	5	9	4	0	1	4	1	28	39	77516	13	2174	0	40
1	4	9	2	3	0	4	1	28	50	83311	13	0	0	13
2	2	11	0	5	1	4	1	28	38	215646	9	0	0	40
3	2	1	2	5	0	2	1	28	53	234721	7	0	0	40
4	2	9	2	9	5	2	0	4	28	338409	13	0	0	40

In [23]:
```
y.head()
```

Out[23]:
```
0    0
1    0
2    0
3    0
4    0
Name: Income, dtype: int64
```

In [24]:
```
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.3,random_state=1)
```

#Logistic Regression :-

In [49]:
```
log = LogisticRegression(max_iter=120)
```

In [50]:
```
log.fit(X_train,y_train)
```

Out[50]:
```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                   intercept_scaling=1, l1_ratio=None, max_iter=120,
                   multi_class='auto', n_jobs=None, penalty='l2',
                   random_state=None, solver='lbfgs', tol=0.0001, verbose=0,
                   warm_start=False)
```

In [51]:
```
log.score(X_test,y_test)
```

Out[51]:
```
0.8
```

In [52]:
```
y_pred = log.predict(X_test)
print('Accuracy of logistic regression classifier on test set: {:.2f}'.format(log.score(X_test,y_test)))
```

```
Accuracy of logistic regression classifier on test set: 0.80
```

In [53]:
```
y_pred = log.predict(X_test)
```

In [54]:
```
y_pred
```

Out[54]:
```
array([0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0,
       0, 0])
```

Evaluation Matrics :

In [55]:
```
accuracy_score(y_test,y_pred)
```

Out[55]:
```
0.8
```

In [56]:
```
precision_score(y_test,y_pred)
```
Out[56]:
```
0.6785714285714286
```

In [57]:
```
recall_score(y_test,y_pred)
```
Out[57]:
```
0.2638888888888889
```

In [58]:
```
f1_score(y_test,y_pred)
```
Out[58]:
```
0.38
```

In [59]:
```
print(classification_report(y_test,y_pred))
```
```
              precision    recall  f1-score   support

           0       0.81      0.96      0.88       238
           1       0.68      0.26      0.38        72

    accuracy                           0.80       310
   macro avg       0.75      0.61      0.63       310
weighted avg       0.78      0.80      0.76       310
```

In [ ]: