In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
from matplotlib import pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
raw_data_train = pd.read_csv("SalaryData_Train.csv")
raw_data_test = pd.read_csv("SalaryData_Test.csv")
raw_data_train.head()
```

Out[2]:

	age	workclass	education	educationno	maritalstatus	occupation	relationship	race
0	39	State-gov	Bachelors	13	Never-married	Adm-clerical	Not-in-family	White
1	50	Self-emp-not-inc	Bachelors	13	Married-civ-spouse	Exec-managerial	Husband	White
2	38	Private	HS-grad	9	Divorced	Handlers-cleaners	Not-in-family	White
3	53	Private	11th	7	Married-civ-spouse	Handlers-cleaners	Husband	Black
4	28	Private	Bachelors	13	Married-civ-spouse	Prof-specialty	Wife	Black

In [3]:
```
df_train = raw_data_train.copy() #Changes we make in training data
df_test = raw_data_test.copy()
df_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30161 entries, 0 to 30160
Data columns (total 14 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   age            30161 non-null  int64 
 1   workclass      30161 non-null  object
 2   education      30161 non-null  object
 3   educationno    30161 non-null  int64 
 4   maritalstatus  30161 non-null  object
 5   occupation     30161 non-null  object
 6   relationship   30161 non-null  object
 7   race           30161 non-null  object
 8   sex            30161 non-null  object
 9   capitalgain    30161 non-null  int64 
 10  capitalloss    30161 non-null  int64 
 11  hoursperweek   30161 non-null  int64 
 12  native         30161 non-null  object
 13  Salary         30161 non-null  object
dtypes: int64(5), object(9)
memory usage: 3.2+ MB
```

In [4]:
```
df_train.describe()
```

Out[4]:

	age	educationno	capitalgain	capitalloss	hoursperweek
count	30161.000000	30161.000000	30161.000000	30161.000000	30161.000000
mean	38.438115	10.121316	1092.044064	88.302311	40.931269
std	13.134830	2.550037	7406.466611	404.121321	11.980182
min	17.000000	1.000000	0.000000	0.000000	1.000000
25%	28.000000	9.000000	0.000000	0.000000	40.000000
50%	37.000000	10.000000	0.000000	0.000000	40.000000
75%	47.000000	13.000000	0.000000	0.000000	45.000000
max	90.000000	16.000000	99999.000000	4356.000000	99.000000

Feature Analysis

In [5]:
```
for x in range(1,len(df_train.columns)):
    print(df_train.iloc[:,x].value_counts())
    print('\n')
```

```
 Ireland                          24
 Hong                             19
 Cambodia                         18
 Trinadad&Tobago                  18
 Laos                             17
 Thailand                         17
 Yugoslavia                       16
 Outlying-US(Guam-USVI-etc)       14
 Hungary                          13
 Honduras                         12
 Scotland                         11
Name: native, dtype: int64


 <=50K    22653
 >50K      7508
Name: Salary, dtype: int64
```

In [6]:
```
for x in range(1,len(df_train.columns)):
    print(df_train.iloc[:,x].value_counts())
    print('\n')
```

```
 Private             22285
 Self-emp-not-inc     2499
 Local-gov            2067
 State-gov            1279
 Self-emp-inc         1074
 Federal-gov           943
 Without-pay            14
Name: workclass, dtype: int64


 HS-grad         9840
 Some-college    6677
 Bachelors       5044
 Masters         1627
 Assoc-voc       1307
 11th            1048
 Assoc-acdm      1008
 10th             820
 7th-8th          557
```

Label Encoding

In [7]:
```
df_train.columns.values
```

Out[7]:
```
array(['age', 'workclass', 'education', 'educationno', 'maritalsta
tus',
       'occupation', 'relationship', 'race', 'sex', 'capitalgain',
       'capitalloss', 'hoursperweek', 'native', 'Salary'], dtype=o
bject)
```

In [8]:
```
from sklearn import preprocessing #Label Encoding
label_encoder = preprocessing.LabelEncoder()
df_train.education= label_encoder.fit_transform(df_train.education)
df_train.maritalstatus= label_encoder.fit_transform(df_train.marita
df_train.workclass= label_encoder.fit_transform(df_train.workclass)
df_train.occupation= label_encoder.fit_transform(df_train.occupatio
df_train.relationship= label_encoder.fit_transform(df_train.relatio
df_train.race= label_encoder.fit_transform(df_train.race)
df_train.sex= label_encoder.fit_transform(df_train.sex)
df_train.native= label_encoder.fit_transform(df_train.native)
df_train.Salary= label_encoder.fit_transform(df_train.Salary)
df_train.head()
```

Out[8]:

	age	workclass	education	educationno	maritalstatus	occupation	relationship	race	s
0	39	5	9	13	4	0	1	4	
1	50	4	9	13	2	3	0	4	
2	38	2	11	9	0	5	1	4	
3	53	2	1	7	2	5	0	2	
4	28	2	9	13	2	9	5	2	

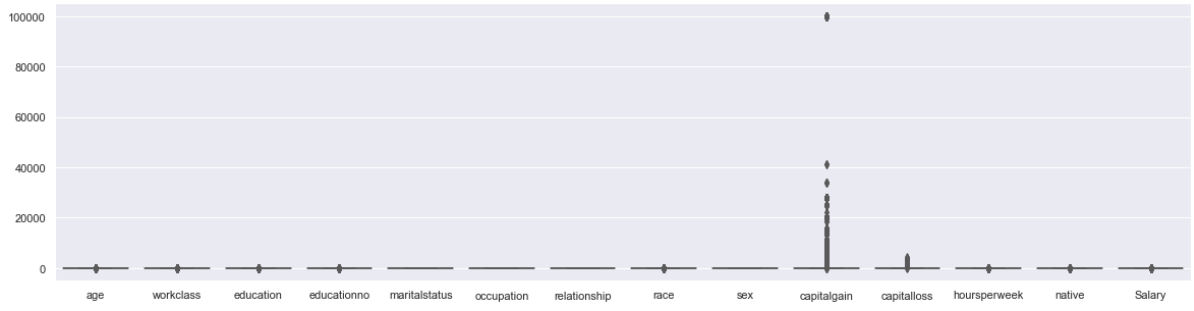
In [9]:
```
label_encoder = preprocessing.LabelEncoder()
df_test.education= label_encoder.fit_transform(df_test.education)
df_test.maritalstatus= label_encoder.fit_transform(df_test.maritals
df_test.workclass= label_encoder.fit_transform(df_test.workclass)
df_test.occupation= label_encoder.fit_transform(df_test.occupation)
df_test.relationship= label_encoder.fit_transform(df_test.relations
df_test.race= label_encoder.fit_transform(df_test.race)
df_test.sex= label_encoder.fit_transform(df_test.sex)
df_test.native= label_encoder.fit_transform(df_test.native)
df_test.Salary= label_encoder.fit_transform(df_test.Salary)
```

In [10]:
```
df_train.Salary.value_counts()
```

Out[10]:
```
0    22653
1     7508
Name: Salary, dtype: int64
```

In [11]:
```
sns.set(rc={'figure.figsize':(20,5)})
sns.boxplot(data=df_train, orient="v", palette="Set2")
```

Out[11]: <AxesSubplot:>



In [12]:
```
from imblearn.combine import SMOTETomek
from collections import Counter

resamp = df_train.copy()

a = resamp.iloc[:,:-1]
b = resamp.iloc[:,-1]

print(Counter(b))

smt = SMOTETomek(sampling_strategy = 'auto')
m, n = smt.fit_resample(a, b)

print(Counter(n))
```

```
Counter({0: 22653, 1: 7508})
Counter({0: 22238, 1: 22238})
```

Train | Split dataset

In [14]:
```
X_train =m
X_test = df_test.iloc[:,:-1]
y_train = n
y_test = df_test.iloc[:,-1]
```

In [15]:
```
from sklearn.ensemble import BaggingClassifier
from sklearn.multiclass import OneVsRestClassifier
from sklearn.svm import LinearSVC
```

In [16]:
```
_samples=1.0 / n_estimators, n_estimators=n_estimators), n_jobs=-1)
```

In [17]:
```
model.fit(X_train, y_train)
```

```
/opt/anaconda3/lib/python3.9/site-packages/sklearn/svm/_base.py:12
44: ConvergenceWarning: Liblinear failed to converge, increase the
number of iterations.
  warnings.warn(
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/opt/anaconda3/lib/python3.9/site-packages/sklearn/svm/_base.py:12
44: ConvergenceWarning: Liblinear failed to converge, increase the
number of iterations.
  warnings.warn(
```

Out[17]:

▸ **OneVsRestClassifier**

▸ **estimator: BaggingClassifier**

▸ **estimator: LinearSVC**

▸ LinearSVC

Model Evaluation Function

In [19]:
```
from sklearn.metrics import confusion_matrix,classification_report
def report_model(model):
    model_preds = model.predict(X_test)
    print(confusion_matrix(y_test,model_preds))
    print(classification_report(y_test,model_preds))
```

In [20]:
```
report_model(model)
```

```
[[8809 2551]
 [1592 2108]]
              precision    recall  f1-score   support

           0       0.85      0.78      0.81     11360
           1       0.45      0.57      0.50      3700

    accuracy                           0.72     15060
   macro avg       0.65      0.67      0.66     15060
weighted avg       0.75      0.72      0.73     15060
```

In [ ]:
```

```