In [59]:
```
# Importing dataset
import os
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
```

Importing Dataset

In [2]:
```
df = pd.read_csv("Social_Network_Ads.csv")
```

About the Dataset

The Dataset used in these models tells about whether a person of certain age having certain income purchases a product or not. We need to predict whether a targeted audience will purchase the product or not.

It has two features.

--------> Age

--------> Estimated Salary

In [3]:
```
df
```

Out[3]:

	Age	EstimatedSalary	Purchased
0	19	19000	0
1	35	20000	0
2	26	43000	0
3	27	57000	0
4	19	76000	0
...	...	...	...
395	46	41000	1
396	51	23000	1
397	50	20000	1
398	36	33000	0
399	49	36000	1

400 rows × 3 columns

Getting information about dataset

In [24]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 3 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Age              400 non-null    int64
 1   EstimatedSalary  400 non-null    int64
 2   Purchased        400 non-null    int64
dtypes: int64(3)
memory usage: 9.5 KB
```

In [25]:
```
df.index
```

Out[25]:
```
RangeIndex(start=0, stop=400, step=1)
```

In [26]:
```
df.columns
```

Out[26]:
```
Index(['Age', 'EstimatedSalary', 'Purchased'], dtype='object')
```

In [28]:
```
df.corr()
```

Out[28]:

	Age	EstimatedSalary	Purchased
Age	1.000000	0.155238	0.622454
EstimatedSalary	0.155238	1.000000	0.362083
Purchased	0.622454	0.362083	1.000000

Checking null values

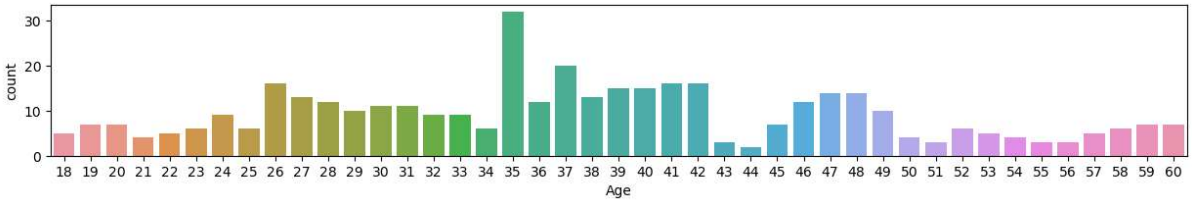
In [27]:
```
df.isnull().sum()
```

Out[27]:
```
Age              0
EstimatedSalary  0
Purchased        0
dtype: int64
```

Visulaizing the dataset

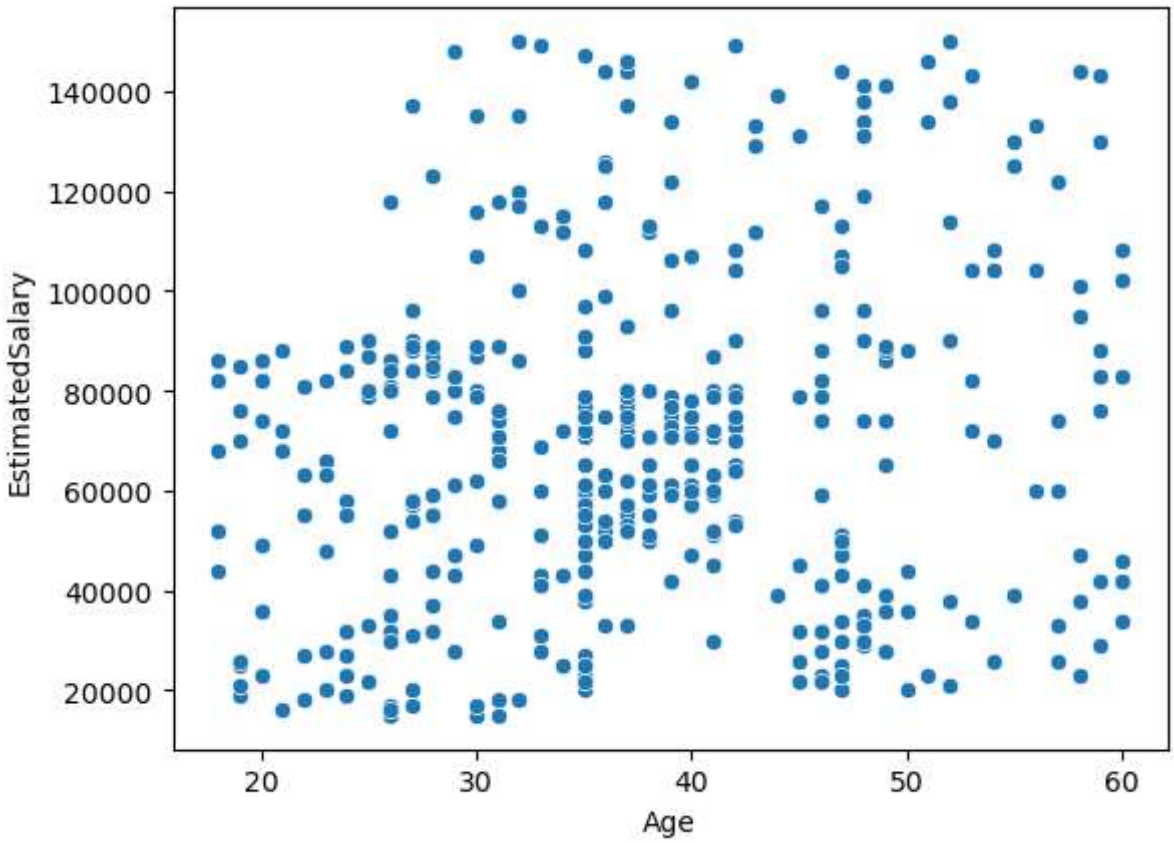
In [38]:
```
plt.figure(figsize=(15,2))
sns.countplot(df["Age"],data =df)
plt.show()
```

```
C:\Users\om123\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureW
arning: Pass the following variable as a keyword arg: x. From version 0.12, t
he only valid positional argument will be `data`, and passing other arguments
without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [40]:
```
sns.scatterplot(data = df,x = df["Age"],y = df["EstimatedSalary"])
```

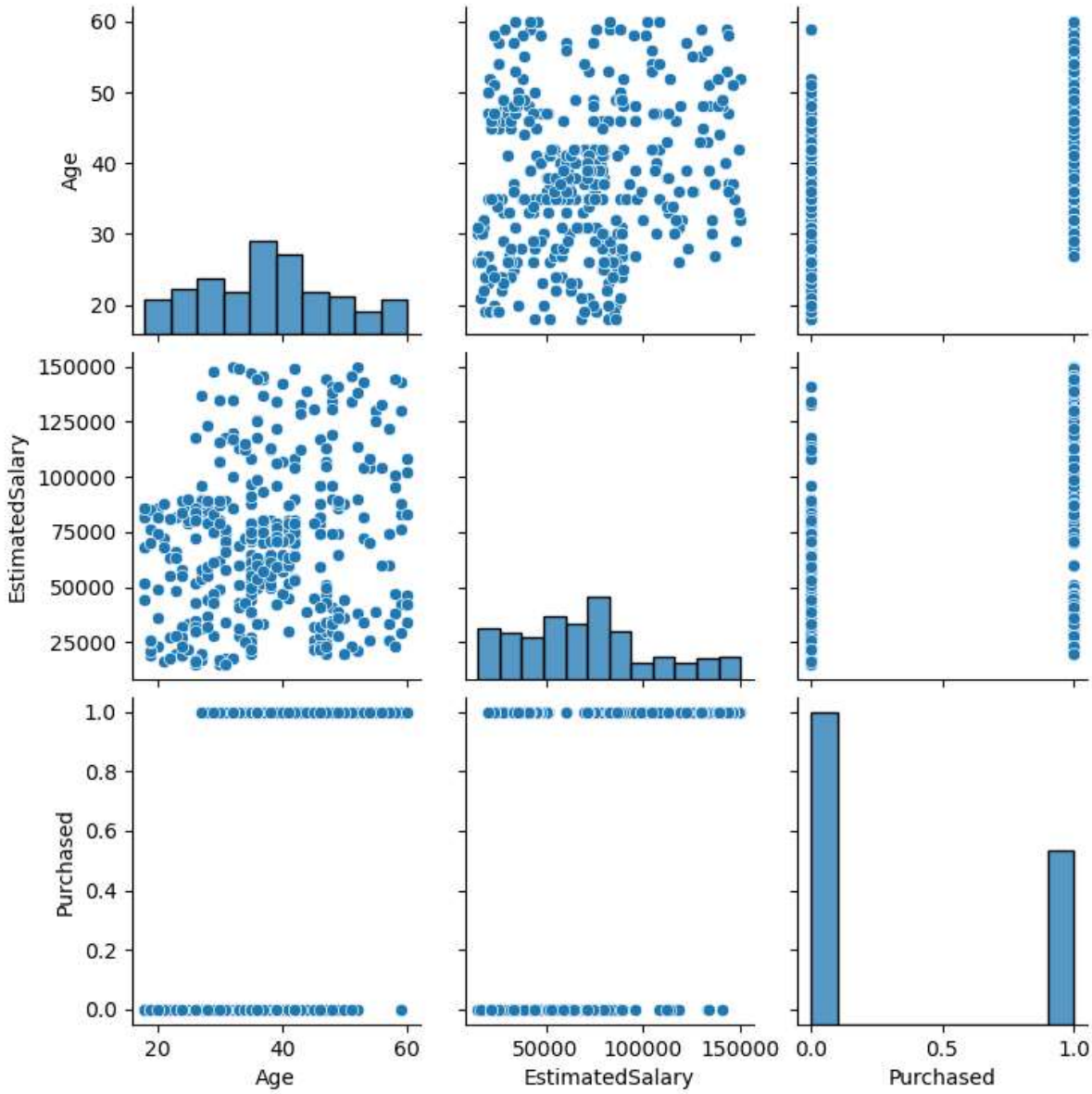
Out[40]:
```
<AxesSubplot:xlabel='Age', ylabel='EstimatedSalary'>
```



Thus, from above visulaization we can say that there is linear independency among the variables.

In [23]:
```
sns.pairplot(data=df)
```

Out[23]: <seaborn.axisgrid.PairGrid at 0x1ed08563160>



Splitting the dependent variable and independent variabe

In [5]:
```
x = df.iloc[:,:-1].values
y = df.iloc[:,-1].values
```

Splitting the dataset into two: training and test dataset

In [6]:
```
from sklearn.model_selection import train_test_split
```

In [7]:
```
 x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2, ra
ndom_state = 0)
```

Applying normalization into "x_train" and "x_test" with the help of Standard Scaler method.

In [8]:
```
from sklearn.preprocessing import StandardScaler
```

In [9]:
```
sc = StandardScaler()
```

In [10]:
```
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
```

Note: We are applying standard Scaler method in x_train dataset that's why we call "fit_transform" method and we are converting 'x_test' into trained model that's why we call "transform" method.

Building Logistic Regression Model

In [13]:
```
from sklearn.linear_model import LogisticRegression
```

In [14]:
```
classifier = LogisticRegression()
```

Training the model by using fit method

In [15]:
```
classifier.fit(x_train, y_train)
```

Out[15]:
```
LogisticRegression()
```

Predicting the output

In [47]:
```
y_pred = classifier.predict(x_test)
```

In [48]:
```
y_pred
```

Out[48]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1], dtype=int64)
```

In [18]:
```
classifier.predict(sc.transform([[30,65000]]))
```

Out[18]:
```
array([0], dtype=int64)
```

In [19]:
```
classifier.predict(sc.transform([[40,65000]]))
```

Out[19]:
```
array([0], dtype=int64)
```

In [20]:
```
classifier.predict(sc.transform([[40,85000]]))
```

Out[20]:
```
array([0], dtype=int64)
```

In [21]:
```
classifier.predict(sc.transform([[50,100000]]))
```

Out[21]:
```
array([1], dtype=int64)
```

Checking the accuracy level of our model

In [41]:
```
classifier.score(x_test, y_test)
```

Out[41]:
```
0.925
```

Confusion Matrix

We generally use confusion matrix to find number of correct and incorrect predictions that our model made.

In [46]:
```
from sklearn.metrics import confusion_matrix
```

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

Out[55]:
```
array([[57,  1],
       [ 5, 17]], dtype=int64)
```

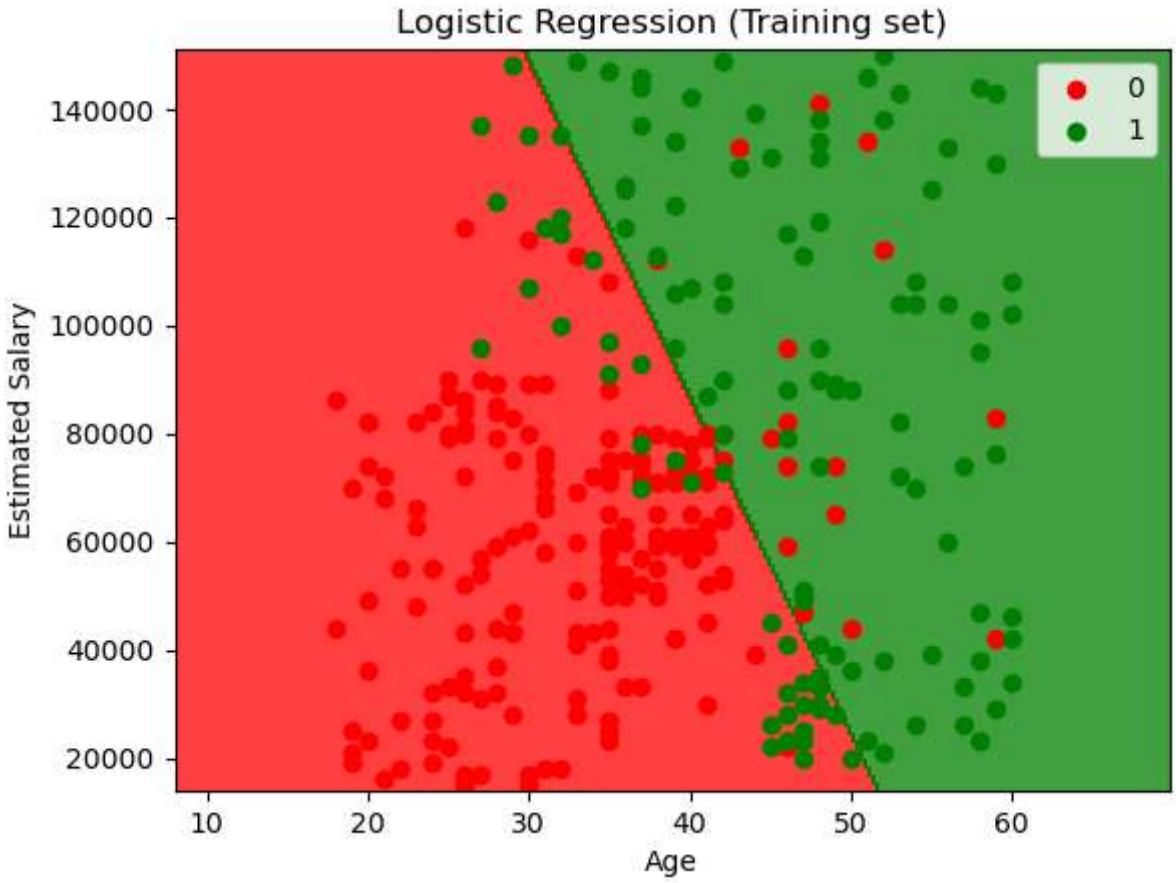
Visualizing the Training dataset

In [57]:
```
from matplotlib.colors import ListedColormap
```

In [65]:
```
x_set, y_set = sc.inverse_transform(x_train), y_train
x1, x2 = np.meshgrid(np.arange(start = x_set[:,0].min() - 10,stop = x_set[:,
0].max() + 10, step = 0.25),
                     np.arange(start = x_set[:,1].min() - 1000,stop = x_set[:,
1].max() +1000, step = 0.25))

plt.contourf(x1, x2, classifier.predict(sc.transform(np.array([x1.ravel(), x2.
ravel()]).T)).reshape(x1.shape),
             alpha =0.75, cmap = ListedColormap(('red','green')))
plt.xlim(x1.min(), x1.max())
plt.ylim(x2.min(), x2.max())
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1], c = ListedColormap
(("red","green"))(i), label = j)
plt.title("Logistic Regression (Training set)")
plt.xlabel("Age")
plt.ylabel("Estimated Salary")
plt.legend()
plt.show()
```

```
*c* argument looks like a single numeric RGB or RGBA sequence, which should b
e avoided as value-mapping will have precedence in case its length matches wi
th *x* & *y*.  Please use the *color* keyword-argument or provide a 2D array
with a single row if you intend to specify the same RGB or RGBA value for all
points.
*c* argument looks like a single numeric RGB or RGBA sequence, which should b
e avoided as value-mapping will have precedence in case its length matches wi
th *x* & *y*.  Please use the *color* keyword-argument or provide a 2D array
with a single row if you intend to specify the same RGB or RGBA value for all
points.
```



Visualizing the Test dataset

In [67]:
```
x_set, y_set = sc.inverse_transform(x_test), y_test
x1, x2 = np.meshgrid(np.arange(start = x_set[:,0].min() - 10,stop = x_set[:,
0].max() + 10, step = 0.25),
                     np.arange(start = x_set[:,1].min() - 1000,stop = x_set[:,
1].max() +1000, step = 0.25))

plt.contourf(x1, x2, classifier.predict(sc.transform(np.array([x1.ravel(), x2.
ravel()]).T)).reshape(x1.shape),
             alpha =0.75, cmap = ListedColormap(('red','green')))
plt.xlim(x1.min(), x1.max())
plt.ylim(x2.min(), x2.max())
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1], c = ListedColormap
(("red","green"))(i), label = j)
plt.title("Logistic Regression (Test set)")
plt.xlabel("Age")
plt.ylabel("Estimated Salary")
plt.legend()
plt.show()
```

```
*c* argument looks like a single numeric RGB or RGBA sequence, which should b
e avoided as value-mapping will have precedence in case its length matches wi
th *x* & *y*.  Please use the *color* keyword-argument or provide a 2D array
with a single row if you intend to specify the same RGB or RGBA value for all
points.
*c* argument looks like a single numeric RGB or RGBA sequence, which should b
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th *x* & *y*.  Please use the *color* keyword-argument or provide a 2D array
with a single row if you intend to specify the same RGB or RGBA value for all
points.
```

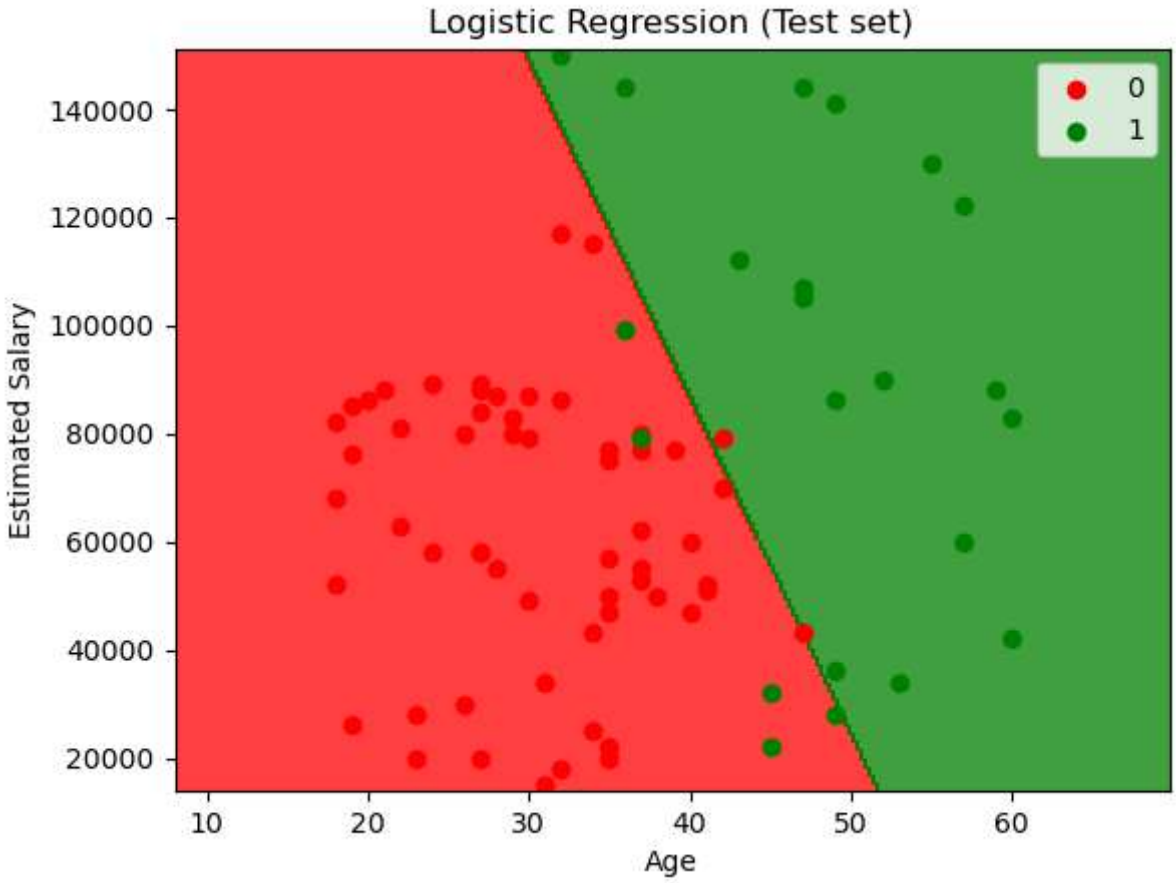

In [ ]: