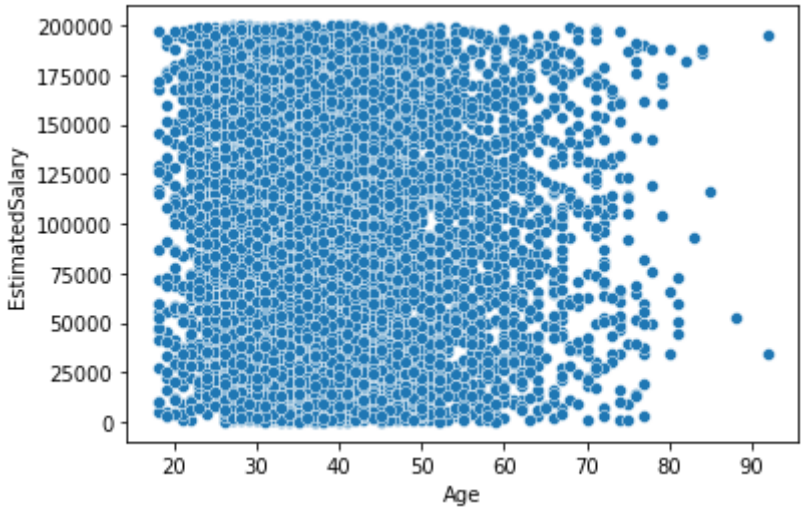
```
# import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")


# load the dataset
df = pd.read_csv("Churn_Modelling.csv")


import matplotlib.pyplot as plt
plt.scatter(df.Age,df.EstimatedSalary)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-5-b3ee707ff7a4> in <module>
      1 import matplotlib.pyplot as plt
----> 2 plt.scatter(df.Age,df.EstimatedSalary)

NameError: name 'df' is not defined
```

SEARCH STACK OVERFLOW

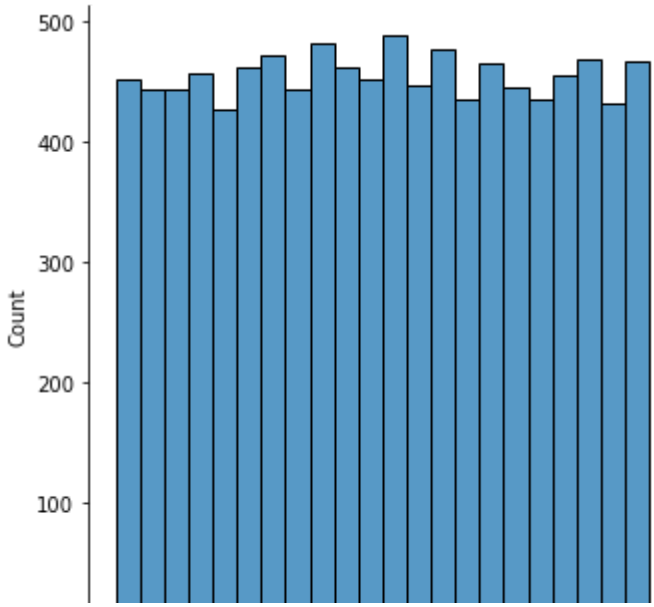
```
import matplotlib.pyplot as plt
import seaborn as sns
sns.scatterplot(x = df.Age,y = df.EstimatedSalary)
```

```
<AxesSubplot:xlabel='Age', ylabel='EstimatedSalary'>
```



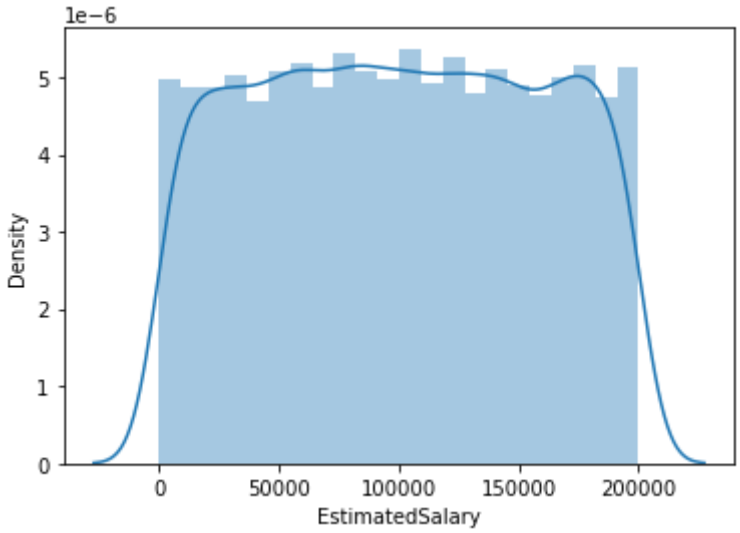

```
import matplotlib.pyplot as plt
import seaborn as sns
sns.displot(df["EstimatedSalary"])
```

```
<seaborn.axisgrid.FacetGrid at 0x1870a5be430>
```



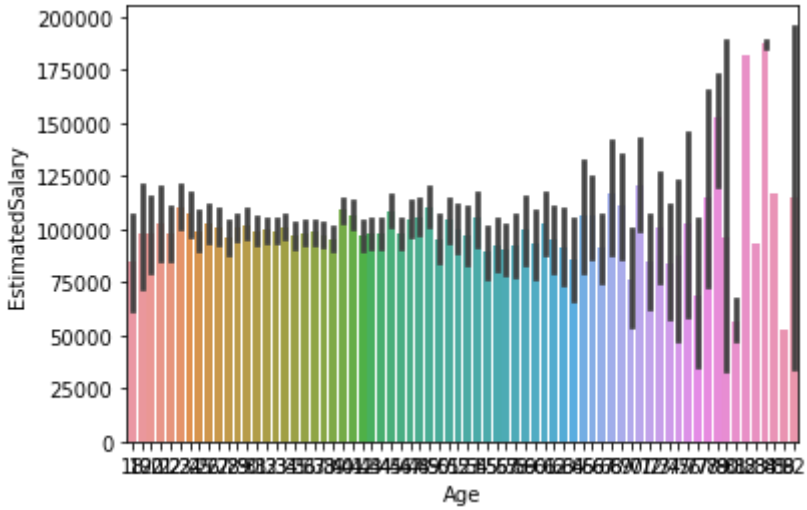

```
import matplotlib.pyplot as plt
import seaborn as sns
sns.distplot(df["EstimatedSalary"])
```

```
<AxesSubplot:xlabel='EstimatedSalary', ylabel='Density'>
```



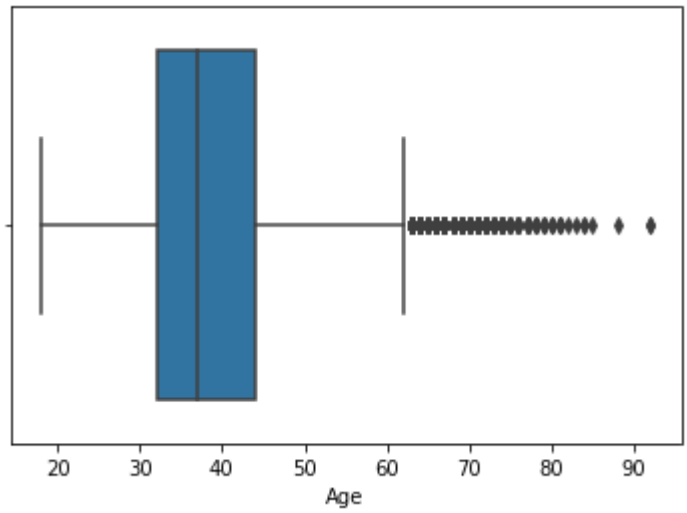

```
# import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")


# load the dataset
df = pd.read_csv("Churn_Modelling.csv")


import matplotlib.pyplot as plt
import seaborn as sns
sns.barplot(df["Age"],df["EstimatedSalary"])
```

```
<AxesSubplot:xlabel='Age', ylabel='EstimatedSalary'>
```



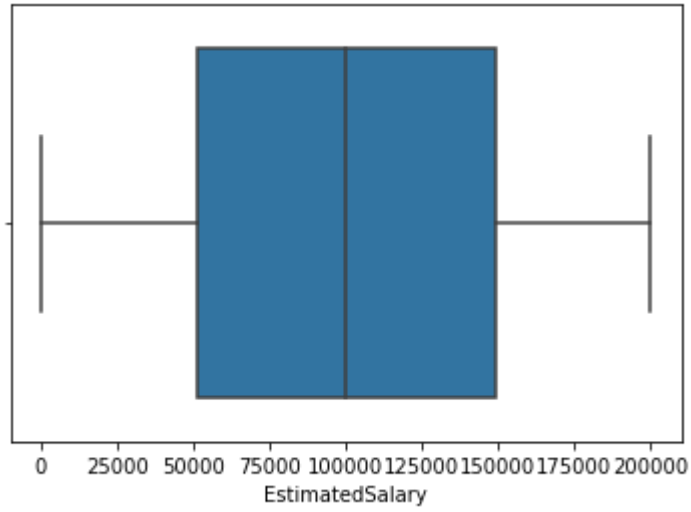

```
sns.boxplot(df["Age"])
```

```
<AxesSubplot:xlabel='Age'>
```



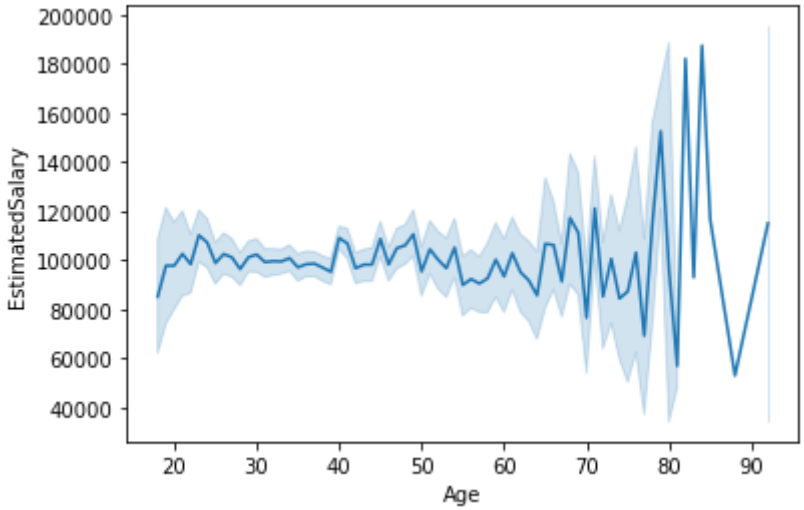

```
sns.boxplot(df["EstimatedSalary"])
```

```
<AxesSubplot:xlabel='EstimatedSalary'>
```



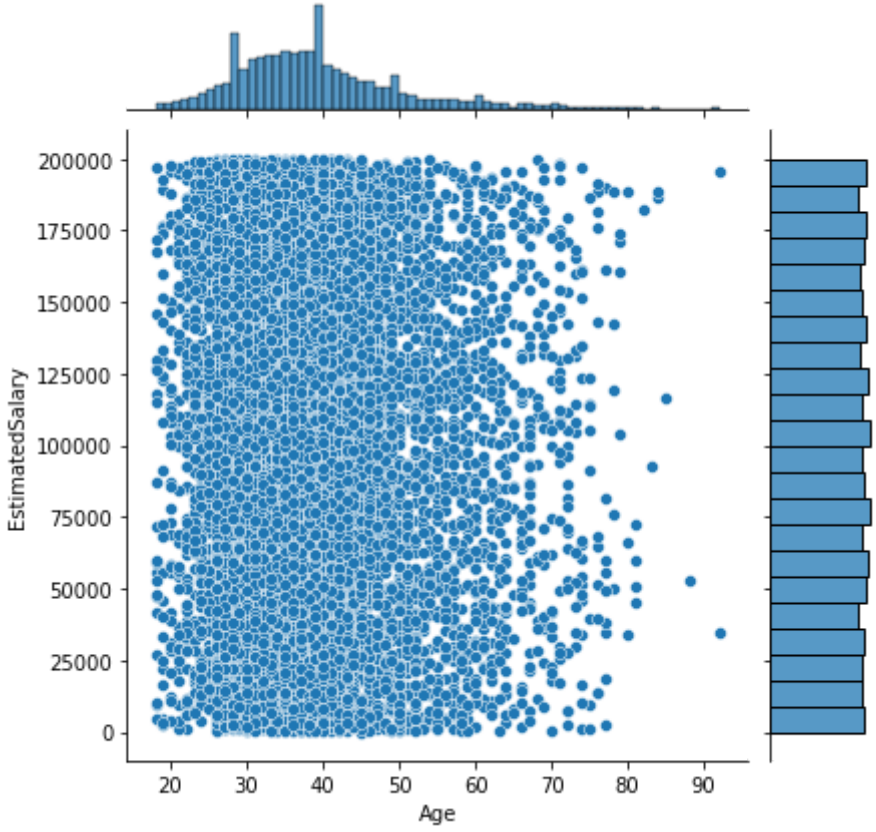

```
sns.lineplot(df["Age"],df["EstimatedSalary"])
```

```
<AxesSubplot:xlabel='Age', ylabel='EstimatedSalary'>
```



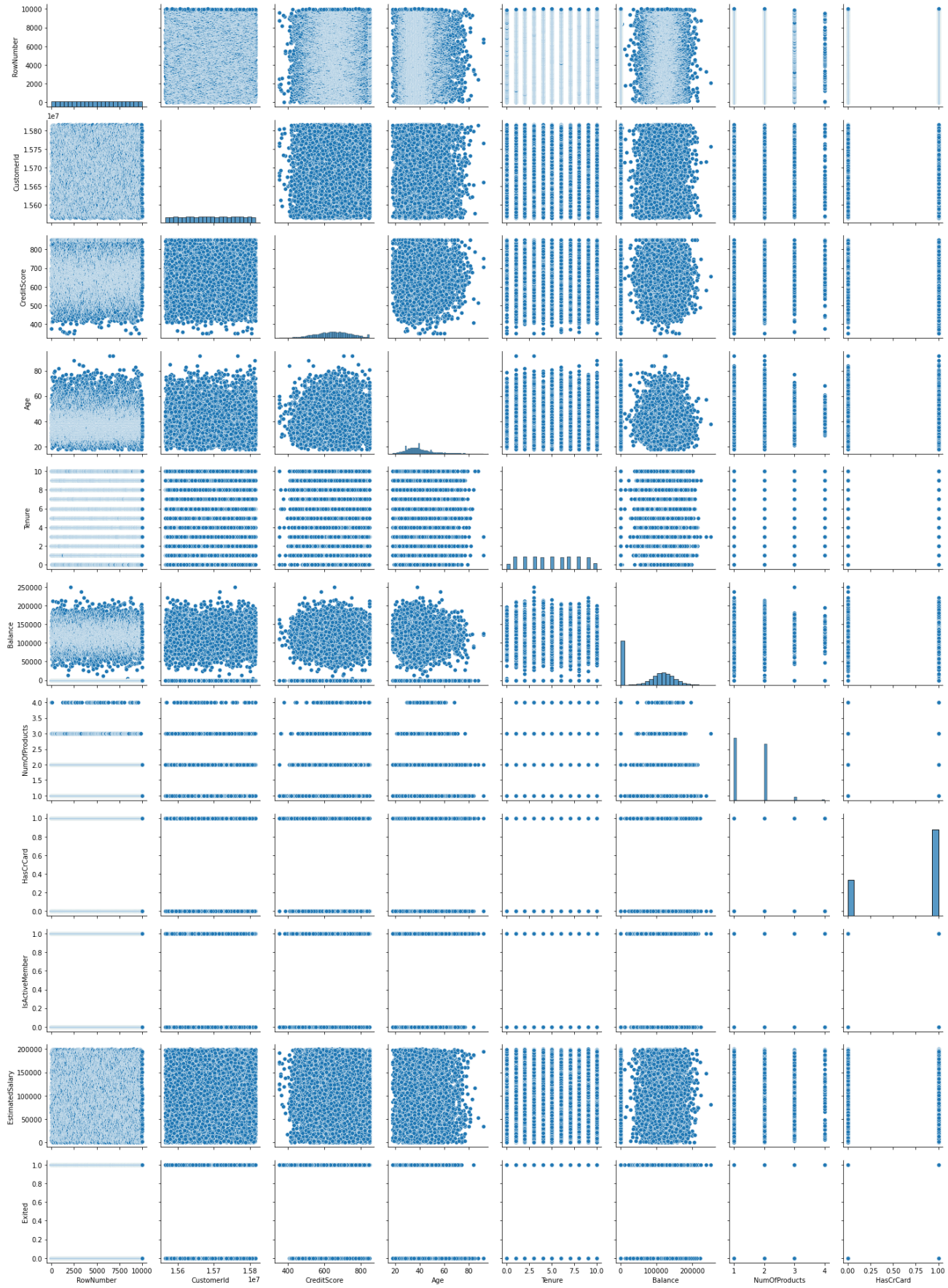

```
sns.jointplot(df["Age"],df["EstimatedSalary"])
```

```
<seaborn.axisgrid.JointGrid at 0x2aee8ac8fd0>
```




```
sns.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x2aee8cbbb50>
```



```
# descriptive statistics
df.describe()
```

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balar
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000(
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889:
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405:
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000(
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000(
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540(
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240(
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090(

```
# handling missing values
df = pd.DataFrame({"Gender":[1,2,np.nan],"Geography":[1,np.nan,np.nan],"Balance":[1,2,3]})
df
```

	Gender	Geography	Balance
0	1.0	1.0	1
1	2.0	NaN	2
2	NaN	NaN	3

```
df.isnull().any()
```

```
RowNumber          False
CustomerId         False
Surname            False
CreditScore        False
Geography          False
Gender             False
Age                False
Tenure             False
Balance            False
NumOfProducts      False
HasCrCard          False
IsActiveMember     False
EstimatedSalary    False
Exited             False
dtype: bool
```

```
qnt = df.quantile(q = (0.25,0.75))
```

```
qnt
```

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	Has
0.25	2500.75	15628528.25	584.0	32.0	3.0	0.00	1.0	
0.75	7500.25	15753233.75	718.0	44.0	7.0	127644.24	2.0	

```
iqr = qnt.loc[0.75] - qnt.loc[0.25]
```

```
iqr
```

```
RowNumber            4999.5000
CustomerId         124705.5000
CreditScore           134.0000
Age                    12.0000
Tenure                  4.0000
Balance            127644.2400
NumOfProducts           1.0000
HasCrCard               1.0000
IsActiveMember          1.0000
EstimatedSalary     98386.1375
Exited                  0.0000
dtype: float64
```

```
lower = qnt.loc [0.25] - 1.5*iqr
lower
```

```
RowNumber         -4.998500e+03
CustomerId         1.544147e+07
CreditScore        3.830000e+02
Age                1.400000e+01
Tenure            -3.000000e+00
Balance           -1.914664e+05
NumOfProducts     -5.000000e-01
HasCrCard         -1.500000e+00
IsActiveMember    -1.500000e+00
EstimatedSalary   -9.657710e+04
Exited             0.000000e+00
dtype: float64
```

```
upper =qnt.loc[0.75] + 1.5*iqr
```

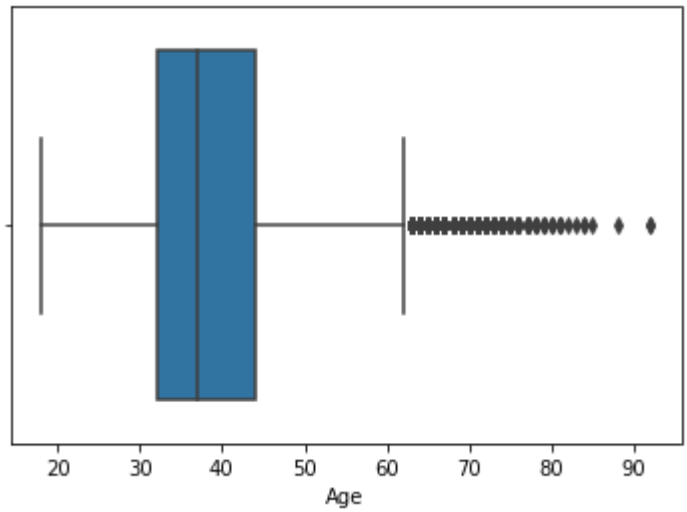
```
upper
```

```
RowNumber          1.499950e+04
CustomerId         1.594029e+07
CreditScore        9.190000e+02
Age                6.200000e+01
Tenure             1.300000e+01
Balance            3.191106e+05
NumOfProducts      3.500000e+00
HasCrCard          2.500000e+00
IsActiveMember     2.500000e+00
EstimatedSalary    2.969675e+05
```

```
Exited             0.000000e+00
dtype: float64
```

```
sns.boxplot(df["Age"])
```

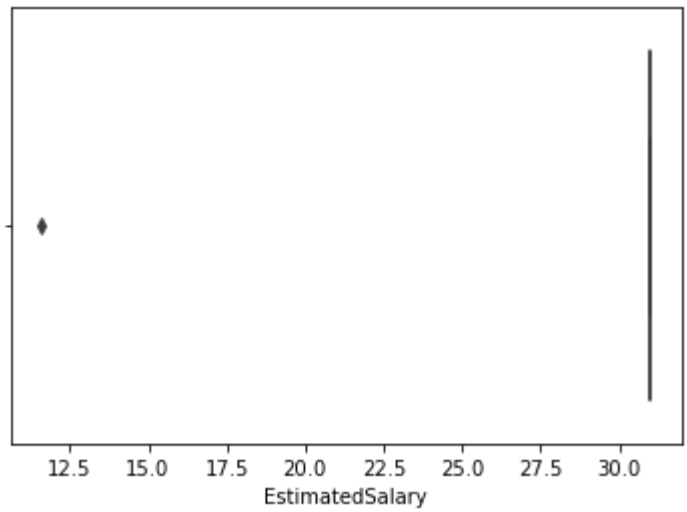
```
<AxesSubplot:xlabel='Age'>
```




```
df["Age"] = np.where(df["Age"]>87,40,df["Age"])
df["EstimatedSalary"] = np.where(df["EstimatedSalary"]>45,31,df["EstimatedSalary"])
```

```
sns.boxplot(df["EstimatedSalary"])
```

```
<AxesSubplot:xlabel='EstimatedSalary'>
```




```
df.head(2)
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Bal
0	1	15634602	Hargrave	619	France	Female	42	2	
1	2	15647311	Hill	608	Spain	Female	41	1	8380

```
df["Age"].replace({"40":0,"32":1},inplace = True)
df["EstimatedSalary"].replace({"31.0":1,"40.0":0},inplace = True)
```

```
df.head(10)
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Ba
0	1	15634602	Hargrave	619	France	Female	42	2	
1	2	15647311	Hill	608	Spain	Female	41	1	838
2	3	15619304	Onio	502	France	Female	42	8	1596
3	4	15701354	Boni	699	France	Female	39	1	
4	5	15737888	Mitchell	850	Spain	Female	43	2	1255
5	6	15574012	Chu	645	Spain	Male	44	8	1137
6	7	15592531	Bartlett	822	France	Male	50	7	
7	8	15656148	Obinna	376	Germany	Female	29	4	1150
8	9	15792365	He	501	France	Male	44	4	1420
9	10	15592389	H?	684	France	Male	27	2	1346

```
df_main = pd.get_dummies(df,columns =["EstimatedSalary"])
```

```
df_main
```

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure
0	1	15634602	Hargrave	619	France	Female	42	2
1	2	15647311	Hill	608	Spain	Female	41	1
2	3	15619304	Onio	502	France	Female	42	8
3	4	15701354	Boni	699	France	Female	39	1
4	5	15737888	Mitchell	850	Spain	Female	43	2
...	...	...	...	...	...	...	...	...
9995	9996	15606229	Obijiaku	771	France	Male	39	5
9996	9997	15569892	Johnstone	516	France	Male	35	10
9997	9998	15584532	Liu	709	France	Female	36	7
9998	9999	15682355	Sabbatini	772	Germany	Male	42	3
9999	10000	15628319	Walker	792	France	Female	28	4

10000 rows × 15 columns

```
# split x & y
x = df.iloc[:,0:1]
x
```

	RowNumber
0	1
1	2
2	3
3	4
4	5
...	...
9995	9996
9996	9997
9997	9998
9998	9999
9999	10000

10000 rows × 1 columns

```
y = df.iloc[:,1:]
y
```

	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance
0	15634602	Hargrave	619	France	Female	42	2	0.00
1	15647311	Hill	608	Spain	Female	41	1	83807.86
2	15619304	Onio	502	France	Female	42	8	159660.80
3	15701354	Boni	699	France	Female	39	1	0.00
4	15737888	Mitchell	850	Spain	Female	43	2	125510.82
...	...	...	...	...	...	...	...	...
9995	15606229	Obijiaku	771	France	Male	39	5	0.00
9996	15569892	Johnstone	516	France	Male	35	10	57369.61
9997	15584532	Liu	709	France	Female	36	7	0.00
9998	15682355	Sabbatini	772	Germany	Male	42	3	75075.31
9999	15628319	Walker	792	France	Female	28	4	130142.79

10000 rows × 13 columns

```
# train test split
```

```
from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.2,random_state=0)

x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

```
((8000, 1), (2000, 1), (8000, 13), (2000, 13))
```

```
x_test
```

	RowNumber
9394	9395
898	899
2398	2399
5906	5907
2343	2344
...	...
1037	1038
2899	2900
9549	9550
2740	2741
6690	6691

2000 rows × 1 columns

```
x_train
```

	RowNumber
7389	7390

y_test

	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance
9394	15615753	Upchurch	597	Germany	Female	35	8	131101.04
898	15654700	Fallaci	523	France	Female	40	2	102967.41
2398	15633877	Morrison	706	Spain	Female	42	8	95386.82
5906	15745623	Worsnop	788	France	Male	32	4	112079.58
2343	15765902	Gibson	706	Germany	Male	38	5	163034.82
...	...	...	...	...	...	...	...	...
1037	15631054	Volkova	625	France	Female	24	1	0.00
2899	15810944	Bryant	586	France	Female	35	7	0.00
9549	15772604	Chiemezie	578	Spain	Male	36	1	157267.95
2740	15787699	Burke	650	Germany	Male	34	4	142393.11
6690	15579223	Niu	573	Germany	Male	30	8	127406.50

2000 rows × 13 columns

y_train

	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Ba
7389	15676909	Mishin	667	Spain	Female	34	5	
9275	15749265	Carslaw	427	Germany	Male	42	1	75
2995	15582492	Moore	535	France	Female	29	2	112
5316	15780386	Ferri	654	Spain	Male	40	5	105
356	15611759	Simmons	850	Spain	Female	57	8	126
...	...	...	...	...	...	...	...	
9225	15584928	Ugochukwutubelum	594	Germany	Female	32	4	120
4859	15647111	White	794	Spain	Female	22	4	114
3264	15574372	Hoolan	738	France	Male	35	5	161
9845	15664035	Parsons	590	Spain	Female	38	9	
2732	15592816	Udokamma	623	Germany	Female	48	1	108

8000 rows × 13 columns