In [18]:

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

In [2]:

```
df = pd.read_csv('Social_Network_Ads.csv')
```

In [3]:

```
df
```

Out[3]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

400 rows × 5 columns

In [4]:

```
df.head()
```

Out[4]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0

In [5]:

```
df.tail()
```

Out[5]:

	User ID	Gender	Age	EstimatedSalary	Purchased
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

In [6]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   User ID          400 non-null    int64 
 1   Gender           400 non-null    object
 2   Age              400 non-null    int64 
 3   EstimatedSalary  400 non-null    int64 
 4   Purchased        400 non-null    int64 
dtypes: int64(4), object(1)
memory usage: 15.8+ KB
```

In [7]:

```
df.describe()
```

Out[7]:

	User ID	Age	EstimatedSalary	Purchased
count	4.000000e+02	400.000000	400.000000	400.000000
mean	1.569154e+07	37.655000	69742.500000	0.357500
std	7.165832e+04	10.482877	34096.960282	0.479864
min	1.556669e+07	18.000000	15000.000000	0.000000
25%	1.562676e+07	29.750000	43000.000000	0.000000
50%	1.569434e+07	37.000000	70000.000000	0.000000
75%	1.575036e+07	46.000000	88000.000000	1.000000
max	1.581524e+07	60.000000	150000.000000	1.000000

In [8]:

```
df.dtypes
```

Out[8]:

```
User ID              int64
Gender              object
Age                  int64
EstimatedSalary      int64
Purchased            int64
dtype: object
```

In [9]:

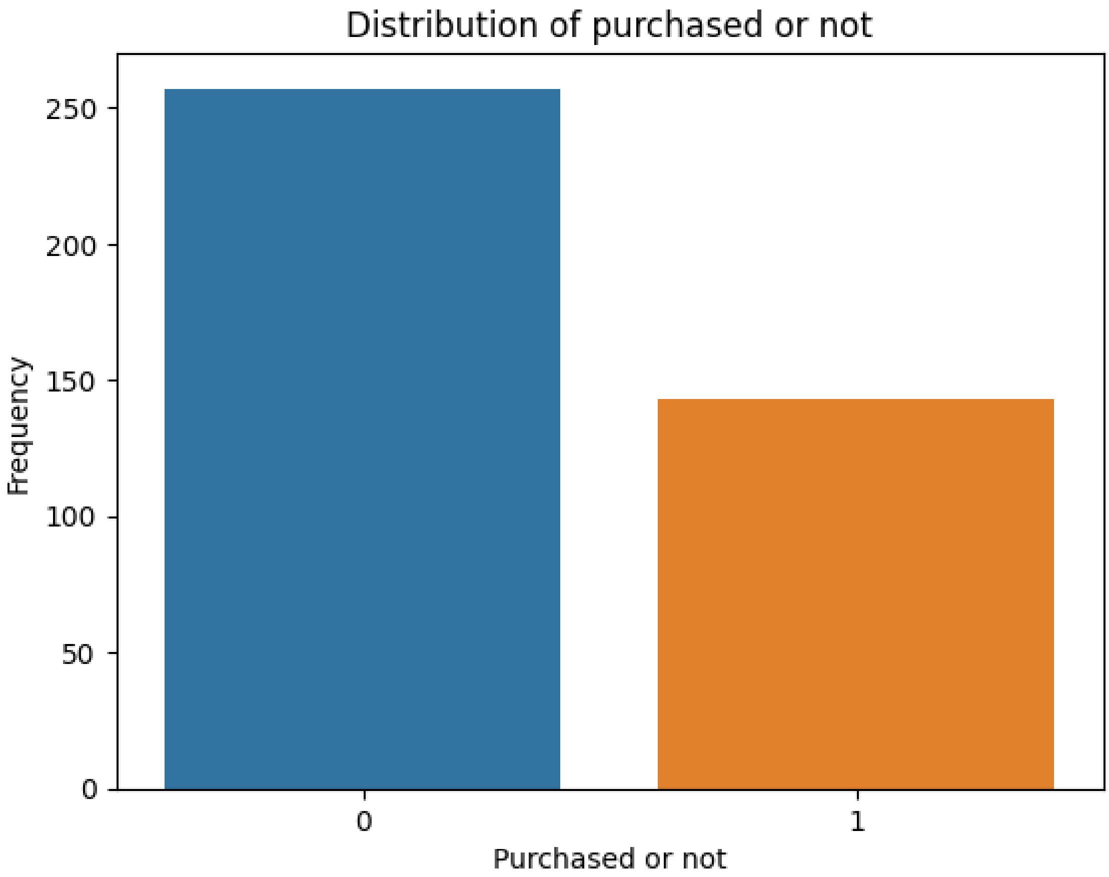
```
df.isna().sum()
```

Out[9]:

```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
Purchased          0
dtype: int64
```

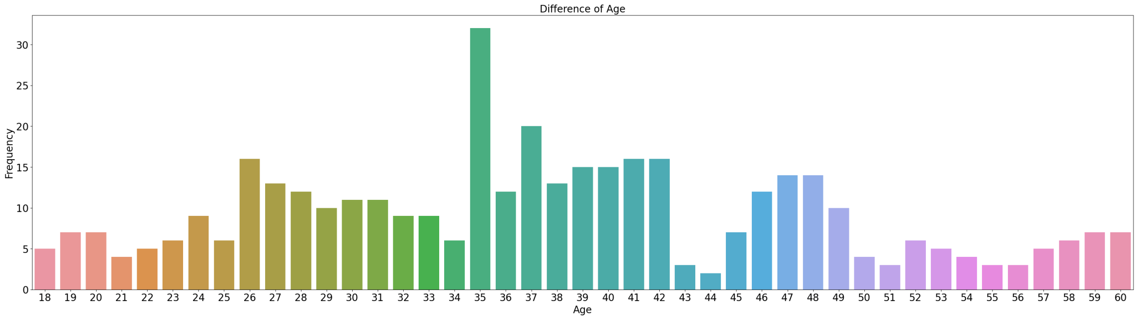
In [39]:

```
sns.countplot(df['Purchased'])
plt.title('Distribution of purchased or not')
plt.xlabel('Purchased or not')
plt.ylabel('Frequency')
plt.show()
```



In [49]:

```
plt.figure(figsize= (40,10))
sns.countplot(df['Age'])
plt.title('Difference of Age',fontsize = 20)
plt.xlabel('Age',fontsize = 20)
plt.ylabel('Frequency',fontsize = 20)
plt.yticks(size=20)
plt.xticks(size=20)
plt.show()
```

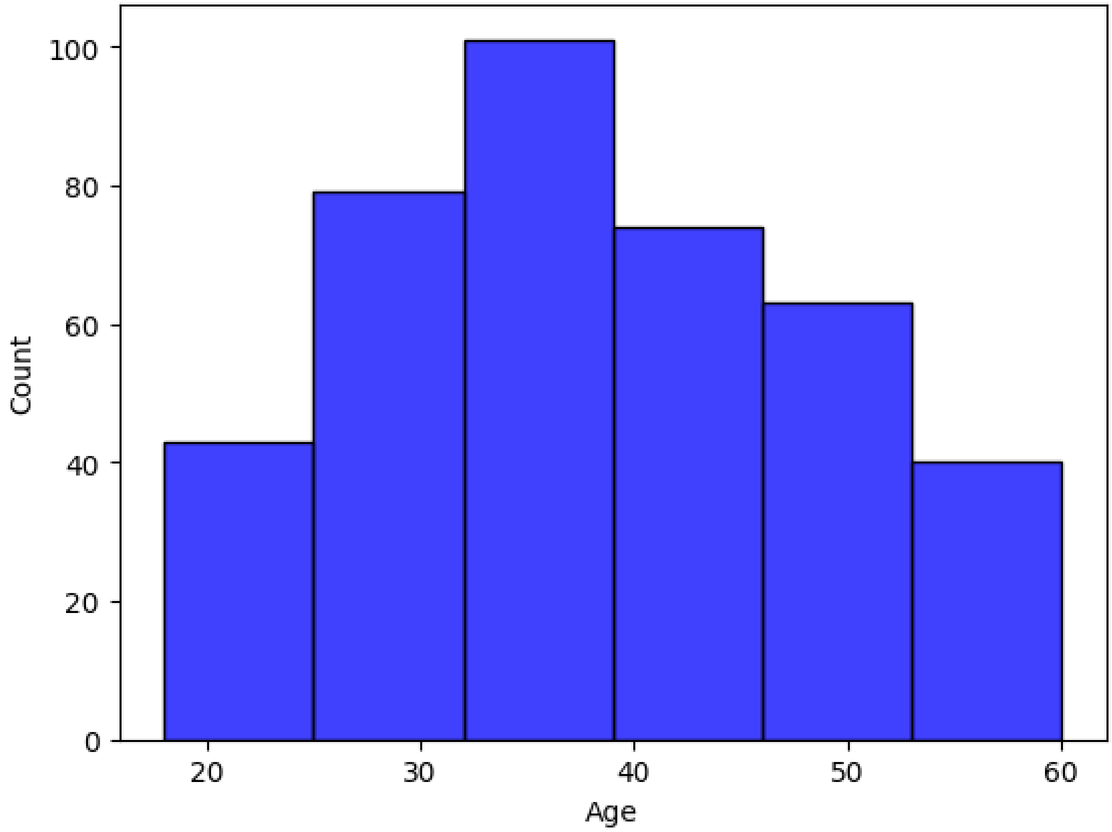


In [58]:

```
sns.histplot(data = df,x='Age',color = 'blue',bins = 6)
```

Out[58]:

```
<Axes: xlabel='Age', ylabel='Count'>
```



In [66]:

```
X = df.iloc[:,[2,3]].values
print(X)
```

```
[[    19  19000]
 [    35  20000]
 [    26  43000]
 [    27  57000]
 [    19  76000]
 [    27  58000]
 [    27  84000]
 [    32 150000]
 [    25  33000]
 [    35  65000]
 [    26  80000]
 [    26  52000]
 [    20  86000]
 [    32  18000]
 [    18  82000]
 [    29  80000]
 [    47  25000]
 [    45  26000]
 [    46  28000]
```

In [62]:

```
Y = df.iloc[:,4]
Y
```

Out[62]:

```
0      0
1      0
2      0
3      0
4      0
      ..
395    1
396    1
397    1
398    0
399    1
Name: Purchased, Length: 400, dtype: int64
```

In [68]:

```
from sklearn.model_selection import train_test_split
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size = 0.20,random_state = 45)
```

```
(320, 2)
(80, 2)
(320,)
(80,)
```

In [78]:

```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
print(X_train.shape)
print(X_test.shape)
print(Y_train.shape)
print(Y_test.shape)
```

```
(320, 2)
(80, 2)
(320,)
(80,)
```

In [74]:

```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
model.fit(X_train,Y_train)
```

Out[74]:

```
LogisticRegression()
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [75]:

```
y_pred = model.predict(X_test)
```

In [76]:

```
from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
```

In [77]:

```
accuracy = accuracy_score(Y_test,y_pred)
accuracy
```

Out[77]:

```
0.8375
```

In [81]:

```
confusion = confusion_matrix(Y_test,y_pred)
print(confusion)
```

```
[[45  3]
 [10 22]]
```

In [84]:

```
tp = confusion[0][0]
tn = confusion[1][1]
fp = confusion[1][0]
fn = confusion[0][1]
total = tp+tn+fp+fn
error_rate = (fp+fn)/total
print(error_rate)
accuracy = 1-error_rate
print(accuracy)
```

```
0.1625
0.8375
```

In [85]:

```
print(classification_report(Y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.82      0.94      0.87        48
           1       0.88      0.69      0.77        32

    accuracy                           0.84        80
   macro avg       0.85      0.81      0.82        80
weighted avg       0.84      0.84      0.83        80
```

In [ ]:

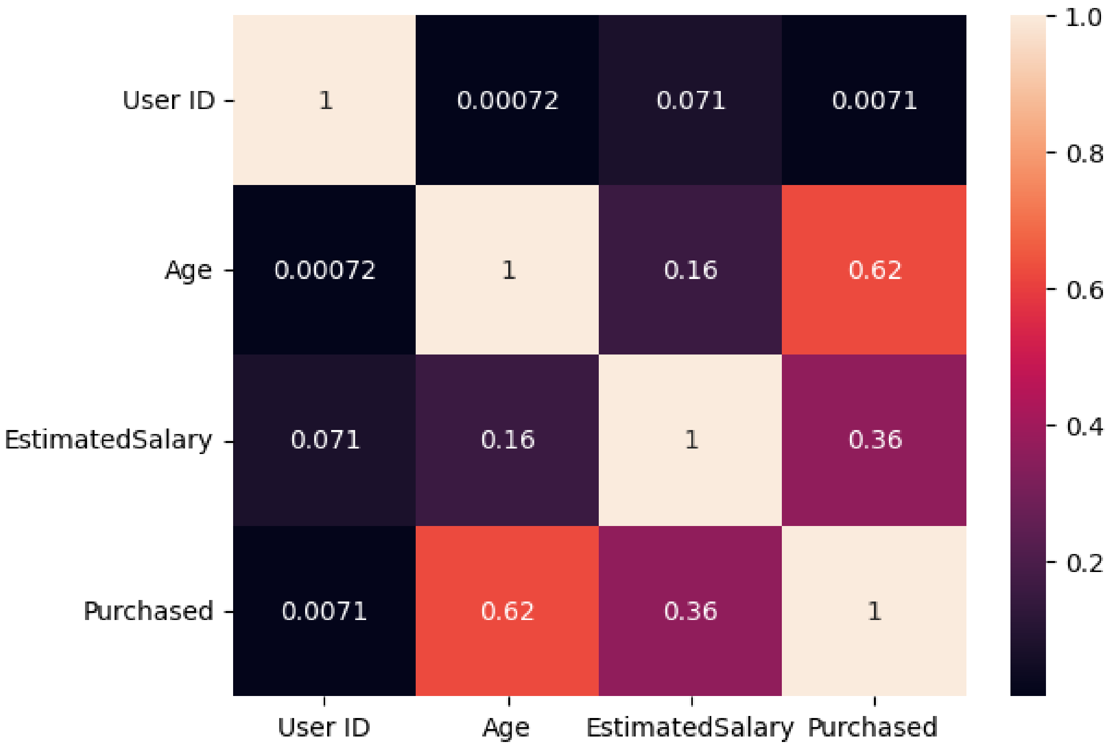
```
#Precision – What percent of your predictions were correct? tp / (tp + fp)
#Recall – What percent of the positive cases did you catch? tp / (tp + fn)
#F1 score – What percent of positive predictions were correct? 2*(precision+recall)/(pre
#Support is the number of actual occurrences of the class in the specified dataset.
```

In [88]:

```
sns.heatmap(df.corr().abs(),annot = True)
```

Out[88]:

```
<Axes: >
```

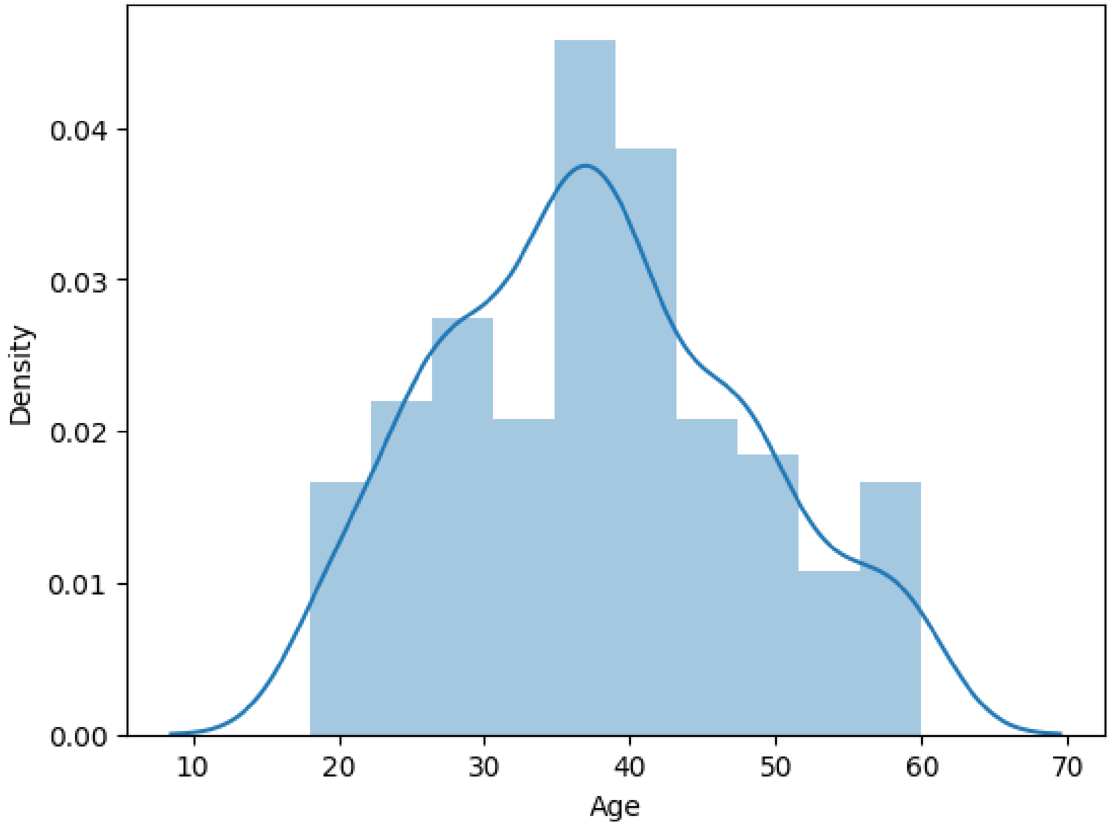


In [89]:

```
sns.distplot(df['Age'])
```

Out[89]:

```
<Axes: xlabel='Age', ylabel='Density'>
```



In [ ]:

```
```