In [1]:

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

In [2]:

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

Out[2]:

	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 [3]:

```
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 [4]:

```
df.describe()
```

Out[4]:

	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 [5]:

```
df["Purchased"].value_counts()
```

Out[5]:

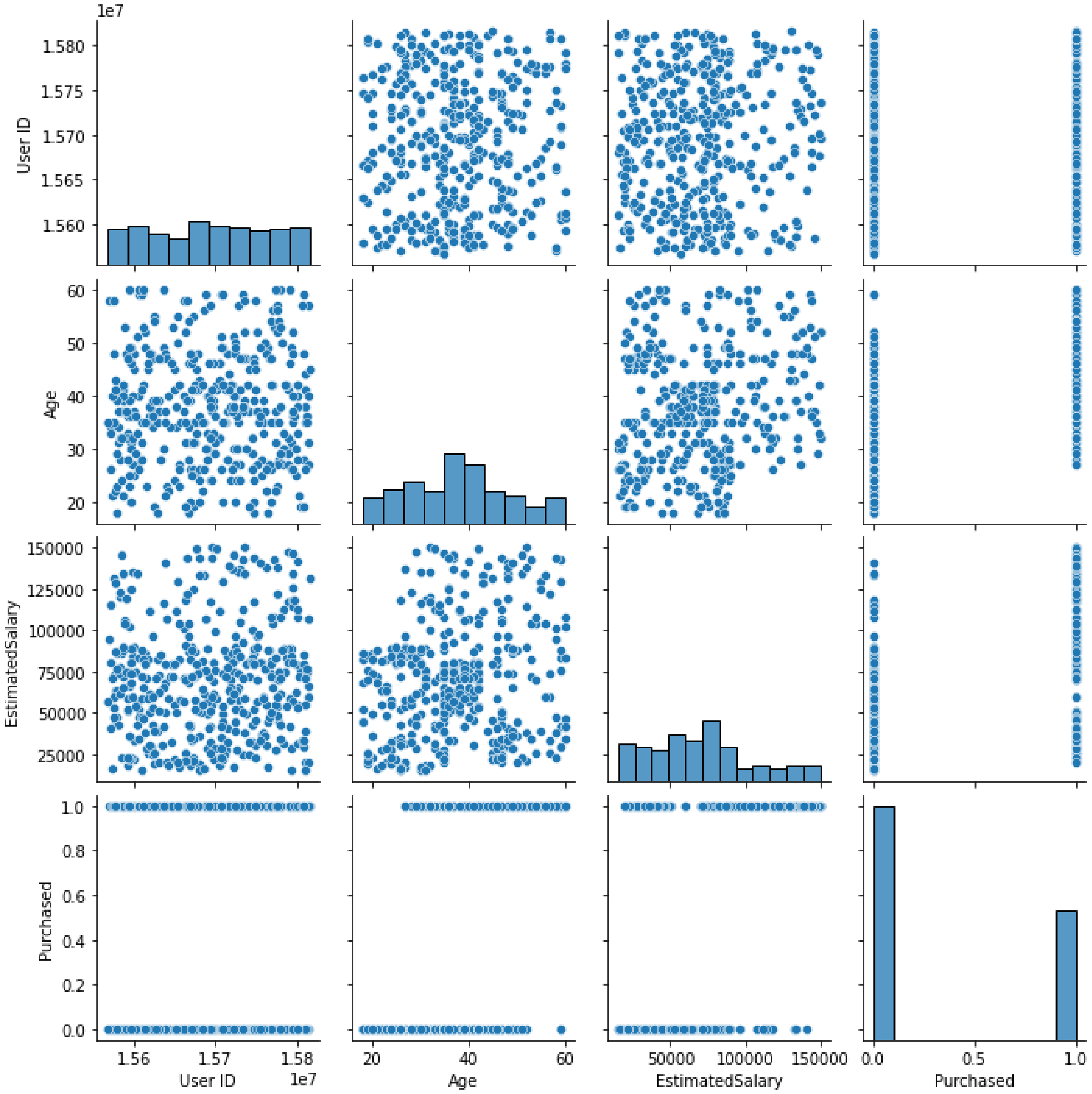
```
0    257
1    143
Name: Purchased, dtype: int64
```

In [6]:

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

Out[6]:

```
<seaborn.axisgrid.PairGrid at 0x17b219e4a30>
```

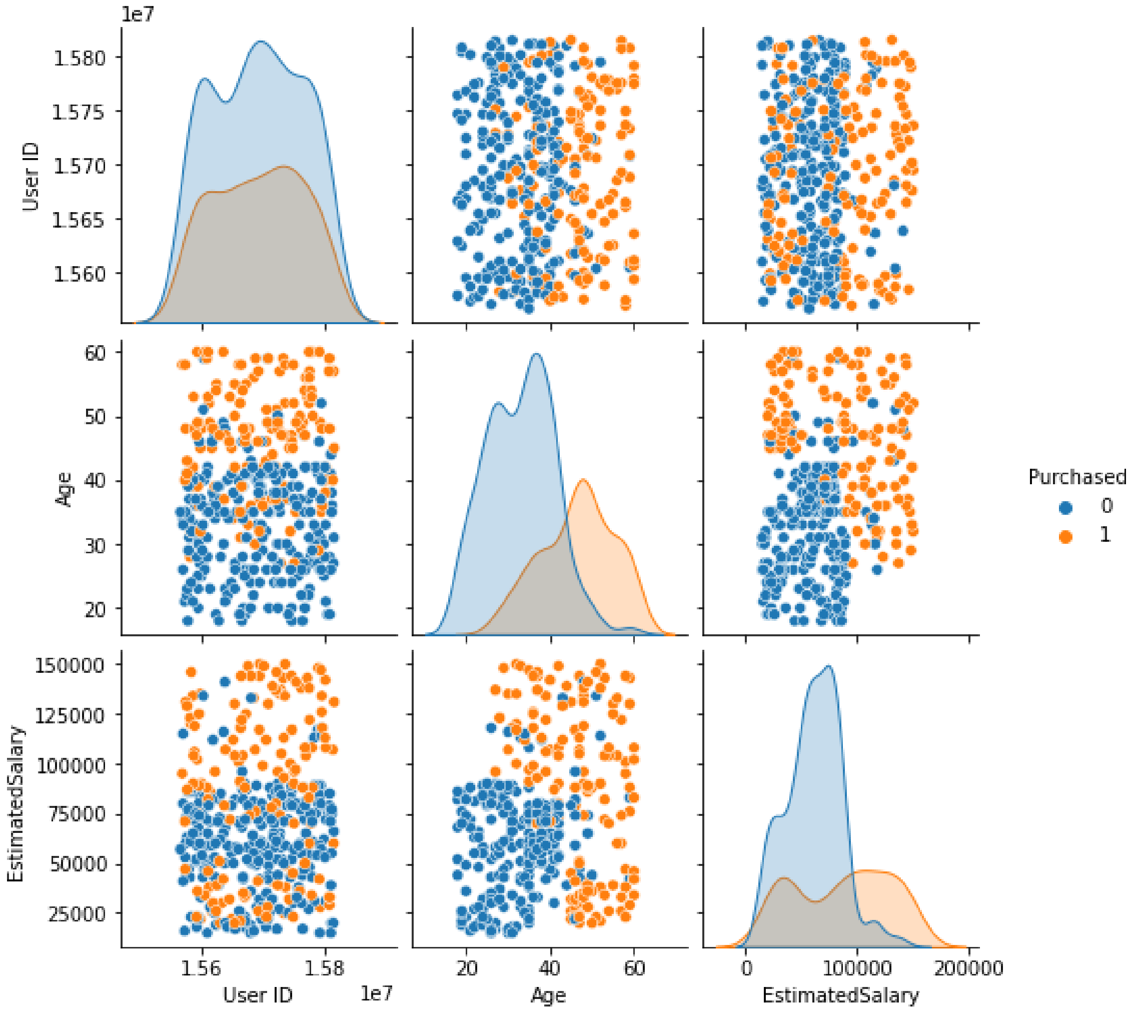


In [7]:

```
sns.pairplot(df, hue="Purchased")
```

Out[7]:

```
<seaborn.axisgrid.PairGrid at 0x17b248b4850>
```



In [8]:

```
df.head()
```

Out[8]:

	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 [9]:

```
x = df.iloc[:,[2,3]]  #2D
y = df.iloc[:,-1]     #1D
```

In [10]:

```
x
```

Out[10]:

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

400 rows × 2 columns

In [11]:

```
y
```

Out[11]:

```
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 [12]:

```
from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.2,random_state=0)
```

In [13]:

```
from sklearn.neighbors import KNeighborsClassifier

knn = KNeighborsClassifier(n_neighbors=5)

knn.fit(xtrain,ytrain)

ypred = knn.predict(xtest)
```

In [14]:

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

ac = accuracy_score(ytest,ypred)
cr = classification_report(ytest,ypred)
cf = confusion_matrix(ytest,ypred)

print(f"Accuarcy :- {ac}\n\n {cf} \n\n {cr}")
```

```
Accuarcy :- 0.8375

 [[52  6]
 [ 7 15]]

               precision    recall  f1-score   support

           0       0.88      0.90      0.89        58
           1       0.71      0.68      0.70        22

    accuracy                           0.84        80
   macro avg       0.80      0.79      0.79        80
weighted avg       0.84      0.84      0.84        80
```

In [15]:

```
train = knn.score(xtrain,ytrain)
test = knn.score(xtest,ytest)

print(f"Training Accuracy :- {train}\n Testing Accuracy:- {test}")
```

```
Training Accuracy :- 0.871875
 Testing Accuracy:- 0.8375
```

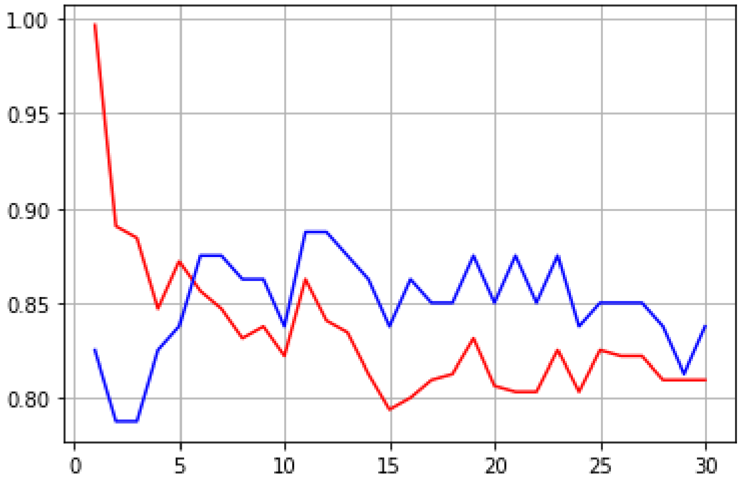
Hyperparameter Tuning

In [16]:

```
trainac = []
testac = []

for i in range(1,31):
    knn = KNeighborsClassifier(n_neighbors=i)
    knn.fit(xtrain,ytrain)

    train = knn.score(xtrain,ytrain)
    test = knn.score(xtest,ytest)

    trainac.append(train)
    testac.append(test)
```

In [18]:

```
plt.plot(range(1,31),trainac,color="red")
plt.plot(range(1,31),testac,color="blue")
plt.grid()
plt.show()
```



In [25]:

```
from sklearn.neighbors import KNeighborsClassifier

knn = KNeighborsClassifier(n_neighbors=6)

knn.fit(xtrain,ytrain)

ypred = knn.predict(xtest)
```

In [26]:

```
train = knn.score(xtrain,ytrain)
test = knn.score(xtest,ytest)

print(f"Training Accuracy :- {train}\n Testing Accuracy:- {test}")
```

```
Training Accuracy :- 0.85625
 Testing Accuracy:- 0.875
```

In [27]:

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

ac = accuracy_score(ytest,ypred)
cr = classification_report(ytest,ypred)
cf = confusion_matrix(ytest,ypred)

print(f"Accuarcy :- {ac}\n\n {cf} \n\n {cr}")
```

```
Accuarcy :- 0.875

 [[56  2]
 [ 8 14]]

               precision    recall  f1-score   support

           0       0.88      0.97      0.92        58
           1       0.88      0.64      0.74        22

    accuracy                           0.88        80
   macro avg       0.88      0.80      0.83        80
weighted avg       0.88      0.88      0.87        80
```

Forecast New Observation

In [29]:

```
age = 41
es = 150000

newob = [[age,es]]
knn.predict(newob)
```

Out[29]:

```
array([1], dtype=int64)
```

In [30]:

```
def purchase():
    age=float(input("Enter Customer AGE:- "))
    es = float(input("Enter Customer Salary:- "))

    newob = [[age,es]]
    yp = knn.predict(newob)[0]

    if yp==1:
        print("Yes, The Customer Will Definetly Purchase The Product..!!!!!!!")

    else:
        print("No, The Customer Will Not At All Purchase The Product..!!!!!!!")

    return yp
```

In [41]:

```
purchase()
```

```
Enter Customer AGE:- 35
Enter Customer Salary:- 80000
No, The Customer Will Not At All Purchase The Product..!!!!!!!
```

Out[41]:

```
0
```

In [ ]:

```

```