In [1]:
```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import Perceptron
from sklearn.metrics import accuracy_score
import matplotlib.pyplot as plt
```

In [2]:
```
df = pd.read_csv(r"C:\Users\Admin\Downloads\suv dataset - suv dataset.csv")
df.head()
```

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

In [3]:
```
df.shape
```

Out[3]:
```
(400, 5)
```

In [4]:
```
for col in df.columns:
    print(f"Unique values in '{col}': {df[col].unique()}")
```

```
Unique values in 'User ID': [15624510 15810944 15668575 15603246 15804002 15728773 15598044 15
694829
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 15733883 15617482 15704583 15621083 15649487 15736760 15714658 15599081
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Unique values in 'Gender': ['Male' 'Female']
Unique values in 'Age': [19 35 26 27 32 25 20 18 29 47 45 46 48 49 31 21 28 33 30 23 24 22 59
34
 39 38 37 42 40 36 41 58 55 52 60 56 53 50 51 57 44 43 54]
Unique values in 'EstimatedSalary': [ 19000  20000  43000  57000  76000  58000  84000 150000
33000  65000
  80000  52000  86000  18000  82000  25000  26000  28000  29000  22000
  49000  41000  23000  30000  74000 137000  16000  44000  90000  27000
  72000  31000  17000  51000 108000  15000  79000  54000 135000  89000
  32000  83000  55000  48000 117000  87000  66000 120000  63000  68000
 113000 112000  42000  88000  62000 118000  85000  81000  50000 116000
 123000  73000  37000  59000 149000  21000  35000  71000  61000  75000
```

```
 53000 107000  96000  45000  47000 100000  38000  69000 148000 115000
 34000  60000  70000  36000  39000 134000 101000 130000 114000 142000
 78000 143000  91000 144000 102000 126000 133000 147000 104000 146000
122000  97000  95000 131000  77000 125000 106000 141000  93000 138000
119000 105000  99000 129000  46000  64000 139000]
Unique values in 'Purchased': [0 1]
```

In [5]:
```
df.isnull().sum()
```

Out[5]:
```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
Purchased          0
dtype: int64
```

In [6]:
```
df.duplicated().sum()
```

Out[6]:
```
np.int64(0)
```

In [7]:
```
# Select relevant features and target
X = df[['Age', 'EstimatedSalary']].values
y = df['Purchased'].values
```

In [8]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

In [9]:
```
# z score (-3 to +3)
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

In [10]:
```
X_train
```

Out[10]:
```
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```

In [11]:
```
X_test
```

Out[11]:
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```

```
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[ 1.58249768, -1.28811763],
[-0.28178945, -0.67723898],
[-0.0855487 ,  0.22453427]])
```

In [12]:
```
model = Perceptron(max_iter=1000, eta0=1.0, random_state=42) # eta 0.0001 and 1.
model.fit(X_train, y_train)
```

Out[12]:

Perceptron

```
Perceptron(random_state=42)
```

In [13]:
```
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print(f" Accuracy: {accuracy:.2f}")
```

```
Accuracy: 0.76
```

In [14]:
```
# Assign columns to descriptive variable names
# X = df[['Age', 'EstimatedSalary']].values
age = X_train[:, 0]
salary = X_train[:, 1]
print (age)
```

```
[-1.06675246  0.79753468  0.11069205  0.60129393  1.87685881 -0.57615058
  0.3069328   0.99377543 -1.16487283 -1.55735433  1.0918958  -0.18366908
  0.20881242  0.3069328  -1.16487283  0.11069205  2.07309956  0.40505317
  1.4843773  -0.37990983  1.87685881  0.11069205  0.89565505 -1.36111358
 -0.18366908 -0.57615058  0.99377543 -0.77239133  2.17121993  0.01257167
 -0.4780302   0.11069205  1.68061805  1.0918958   0.50317355 -1.06675246
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  0.6994143   1.58249768  0.79753468 -1.45923396 -0.0855487   0.40505317
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 -0.4780302  -1.85171546  1.0918958  -0.67427095 -0.77239133  0.99377543
 -0.57615058 -0.0855487  -1.94983583  0.40505317 -1.06675246  0.20881242
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  1.58249768 -0.18366908  0.79753468  0.20881242 -0.0855487  -0.87051171
 -0.0855487  -0.28178945  0.40505317 -0.28178945  0.3069328   0.20881242
 -1.16487283 -0.67427095 -0.28178945 -0.28178945 -0.77239133  0.3069328
 -0.96863208  0.79753468 -1.55735433  0.6994143  -0.77239133 -0.37990983
  0.20881242 -0.57615058 -1.45923396 -1.16487283  0.99377543  2.07309956
 -0.28178945 -0.37990983  0.11069205 -1.06675246  2.17121993 -1.36111358
  1.97497918  1.4843773  -0.28178945 -0.18366908  1.87685881 -0.0855487
 -0.4780302   0.3069328   1.38625693  1.38625693 -0.0855487  -1.16487283
 -1.16487283 -1.16487283  0.3069328  -0.67427095 -0.0855487   0.01257167
 -0.67427095  0.40505317  0.79753468 -0.18366908  0.01257167  1.0918958
  1.87685881  0.99377543  0.89565505 -0.4780302  -0.0855487  -1.75359508
  0.20881242 -0.28178945 -1.75359508  0.6994143  -1.16487283  1.97497918
  0.20881242  0.01257167 -0.0855487   1.0918958  -0.18366908  0.3069328
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  0.6994143   0.20881242 -1.36111358 -0.4780302   0.40505317  1.68061805
  1.19001618  0.99377543 -1.85171546  0.3069328   0.20881242 -1.06675246
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  2.17121993 -0.96863208 -1.45923396 -1.45923396 -0.77239133 -1.26299321
  2.07309956  1.97497918 -1.94983583  0.79753468 -1.06675246  1.97497918
  0.99377543  1.0918958   1.19001618  1.4843773   0.20881242  1.38625693
  2.07309956 -0.18366908  0.40505317 -0.0855487   0.99377543  2.07309956
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 -0.67427095 -0.77239133  0.89565505 -1.06675246 -0.28178945 -0.77239133
  0.11069205 -0.87051171  0.3069328   0.99377543  0.01257167 -0.57615058
  0.11069205 -1.16487283  0.11069205 -1.55735433 -0.18366908  2.17121993
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 -1.36111358 -0.37990983 -0.96863208  1.19001618 -0.4780302  -0.87051171
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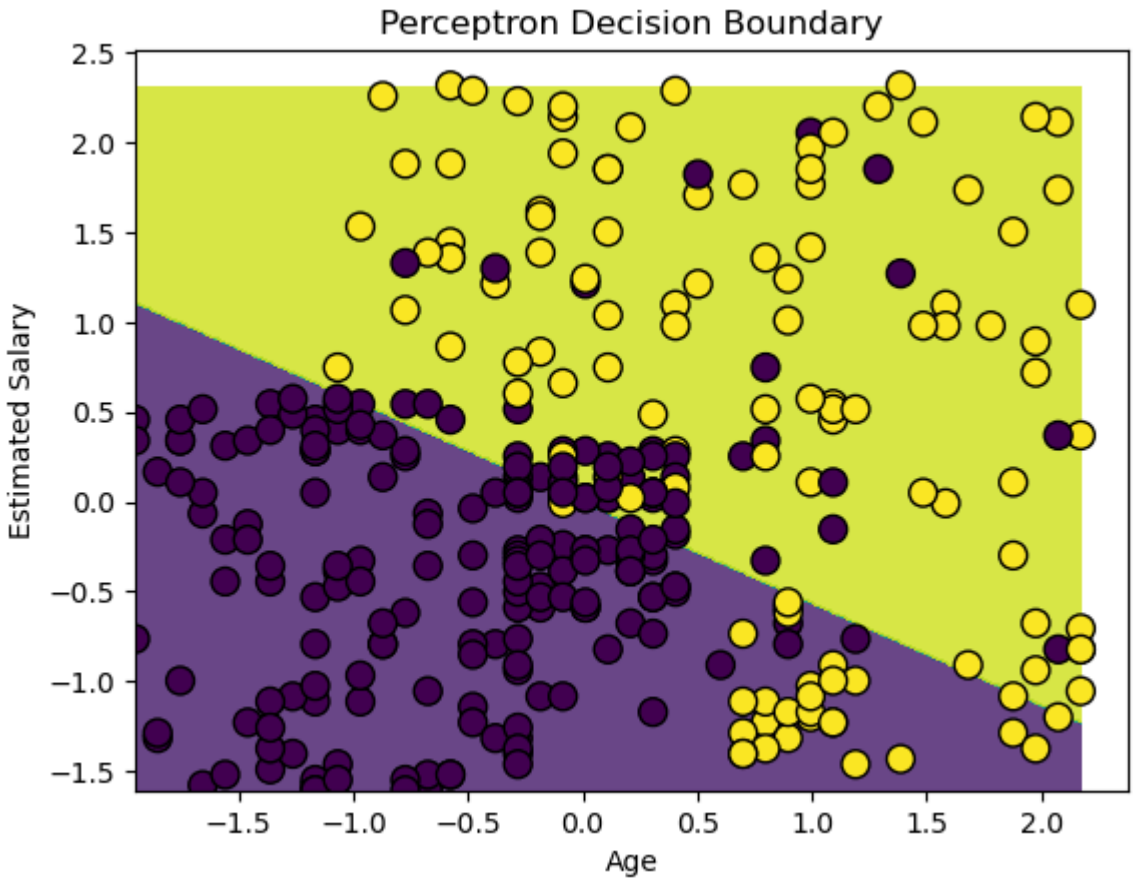
  1.0918958  -0.57615058  0.01257167 -1.85171546 -0.0855487   0.89565505
  0.20881242 -0.18366908 -1.75359508 -0.67427095  0.3069328   0.40505317
 -0.96863208  0.11069205 -0.96863208  0.01257167  0.89565505 -0.0855487
  1.0918958   0.6994143  -0.28178945 -1.36111358 -1.16487283  0.50317355
  0.11069205 -0.57615058]
```

In [15]:

```
# Create a mesh grid using exact min and max values
x_min, x_max = age.min(), age.max()
y_min, y_max = salary.min(), salary.max()
xx, yy = np.meshgrid(
    np.arange(x_min, x_max, 0.01),
    np.arange(y_min, y_max, 0.01)
)
```

```
# Predict class labels for all points in the mesh
Z = model.predict(np.c_[xx.ravel(), yy.ravel()])
Z = Z.reshape(xx.shape)

# Plot the decision boundary
plt.contourf(xx, yy, Z, alpha=0.8)
plt.scatter(age, salary, c=y_train, edgecolors='k', marker='o', s=100)
plt.title('Perceptron Decision Boundary')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.show()
```



In [ ]: