```
import torch
import torch.nn as nn
import torch.optim as optim
import torch.nn.functional as F
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
from torch.utils.data import TensorDataset, DataLoader
```

```
data = pd.read_csv("/content/customers.csv")
data.head()
```

	ID	Gender	Ever_Married	Age	Graduated	Profession	Work_Experience	Spending_Score	Family_Size	Var_1	Segmentation
0	462809	Male	No	22	No	Healthcare	1.0	Low	4.0	Cat_4	D
1	462643	Female	Yes	38	Yes	Engineer	NaN	Average	3.0	Cat_4	A
2	466315	Female	Yes	67	Yes	Engineer	1.0	Low	1.0	Cat_6	B
3	461735	Male	Yes	67	Yes	Lawyer	0.0	High	2.0	Cat_6	B
4	462669	Female	Yes	40	Yes	Entertainment	NaN	High	6.0	Cat_6	A

```
data.columns
```

```
Index(['ID', 'Gender', 'Ever_Married', 'Age', 'Graduated', 'Profession',
       'Work_Experience', 'Spending_Score', 'Family_Size', 'Var_1',
       'Segmentation'],
      dtype='object')
```

```
data = data.drop(columns=["ID"])
```

```
data.fillna({"Work_Experience": 0, "Family_Size": data["Family_Size"].median()}, inplace=True)
```

```
categorical_columns = ["Gender", "Ever_Married", "Graduated", "Profession", "Spending_Score", "Var_1"]
for col in categorical_columns:
    data[col] = LabelEncoder().fit_transform(data[col])
```

```
label_encoder = LabelEncoder()
data["Segmentation"] = label_encoder.fit_transform(data["Segmentation"])
```

```
X = data.drop(columns=["Segmentation"])
y = data["Segmentation"].values
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

```
X_train = torch.tensor(X_train, dtype=torch.float32)
X_test = torch.tensor(X_test, dtype=torch.float32)
y_train = torch.tensor(y_train, dtype=torch.long)
y_test = torch.tensor(y_test, dtype=torch.long)
```

```
test_dataset = TensorDataset(X_test, y_test)
train_loader = DataLoader(test_dataset, batch_size=16, shuffle=True)
test_loader = DataLoader(test_dataset, batch_size=16)
```

```
class PeopleClassifier(nn.Module):
    def __init__(self, input_size):
        super(PeopleClassifier, self).__init__()
        self.fc1 = nn.Linear(input_size,30)
        self.fc2 = nn.Linear(30,14)
        self.fc3 = nn.Linear(14,6)
        self.fc4 = nn.Linear(6,4)

    def forward(self,x):
      x = F.relu(self.fc1(x))
      x = F.relu(self.fc2(x))
```

```
      x = F.relu(self.fc3(x))
      x = self.fc4(x)
      return x
```

```
# Initialize the Model, Loss Function, and Optimizer
model = PeopleClassifier(input_size=X_train.shape[1])
criterion = nn.CrossEntropyLoss()
optimizer = optim.Adam(model.parameters(),lr=0.01)
```

```
def train_model(model, train_loader,criterion,optimizer,epochs):
  for epoch in range(epochs):
    model.train()
    for X_batch, y_batch in train_loader:
      optimizer.zero_grad()
      output = model(X_batch)
      loss = criterion(output,y_batch)
      loss.backward()
      optimizer.step()

    if (epoch + 1) % 10 == 0:
      print(f"Epoch {epoch+1}/{epochs}, Loss: {loss.item():.4f}")
```

```
model.eval()
predictions, actuals = [], []
with torch.no_grad():
    for X_batch, y_batch in test_loader:
        outputs = model(X_batch)
        _, predicted = torch.max(outputs, 1)
        predictions.extend(predicted.numpy())
        actuals.extend(y_batch.numpy())
```

```
accuracy = accuracy_score(actuals, predictions)
conf_matrix = confusion_matrix(actuals, predictions)
class_report = classification_report(actuals, predictions, target_names=[str(i) for i in label_encoder.classes_])
print("Name: A.LAHARI")
print("Register No: 212223230111")
print(f'Test Accuracy: {accuracy:.2f}%')
print("Confusion Matrix:\n", conf_matrix)
print("Classification Report:\n", class_report)
```

```
Name: A.LAHARI
Register No: 212223230111
Test Accuracy: 0.29%
Confusion Matrix:
 [[494   0   0  90]
 [408   0   0  82]
 [415   0   0  57]
 [469   0   0 124]]
Classification Report:
               precision    recall  f1-score   support

            A       0.28      0.85      0.42       584
            B       0.00      0.00      0.00       490
            C       0.00      0.00      0.00       472
            D       0.35      0.21      0.26       593

     accuracy                           0.29      2139
    macro avg       0.16      0.26      0.17      2139
 weighted avg       0.17      0.29      0.19      2139

/usr/local/lib/python3.12/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined ar
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
/usr/local/lib/python3.12/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined ar
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/usr/local/lib/python3.12/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined ar
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
```
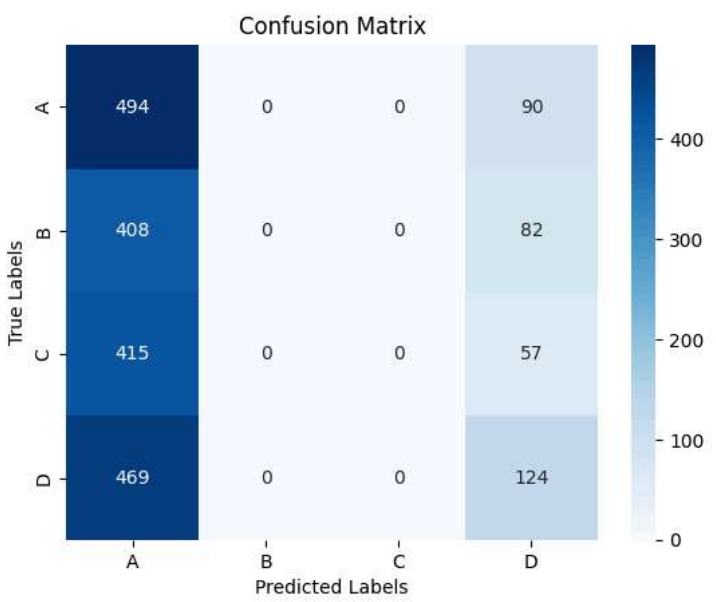

```
import seaborn as sns
import matplotlib.pyplot as plt
sns.heatmap(conf_matrix, annot=True, cmap='Blues', xticklabels=label_encoder.classes_, yticklabels=label_encoder.classes_,fmt='g')
plt.xlabel("Predicted Labels")
plt.ylabel("True Labels")
plt.title("Confusion Matrix")
plt.show()
```




```
sample_input = X_test[12].clone().unsqueeze(0).detach().type(torch.float32)
with torch.no_grad():
    output = model(sample_input)
    # Select the prediction for the sample (first element)
    predicted_class_index = torch.argmax(output[0]).item()
    predicted_class_label = label_encoder.inverse_transform([predicted_class_index])[0]
print("Name: A.LAHARI")
print("Register No: 212223230111")
print(f'Predicted class for sample input: {predicted_class_label}')
print(f'Actual class for sample input: {label_encoder.inverse_transform([y_test[12].item()])[0]}')
```

```
Name: A.LAHARI
Register No: 212223230111
Predicted class for sample input: A
Actual class for sample input: D
```