

In [1]:

```
import tensorflow as tf
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import confusion_matrix, classification_report
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:

```
# Load dataset
df = pd.read_csv("creditcard.csv")

# Drop only 'Time' column
df = df.drop(['Time'], axis=1)

# Separate features and labels
X = df.drop(['Class'], axis=1)
y = df['Class']

# Scale features
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)

# Split data
x_train, x_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.2, random_state=42)

# Train only on normal (non-fraud) data
x_train = x_train[y_train == 0]
```

In [3]:

```
# Build Autoencoder
encoder = tf.keras.models.Sequential([
    tf.keras.layers.Input(shape=(x_train.shape[1],)),
    tf.keras.layers.Dense(64, activation='relu'),
    tf.keras.layers.Dense(32, activation='relu'),
    tf.keras.layers.Dense(16, activation='relu')
])

decoder = tf.keras.models.Sequential([
    tf.keras.layers.Input(shape=(16,)),
    tf.keras.layers.Dense(32, activation='relu'),
    tf.keras.layers.Dense(64, activation='relu'),
    tf.keras.layers.Dense(x_train.shape[1], activation='linear')
])

autoencoder = tf.keras.models.Sequential([encoder, decoder])

# Compile model
autoencoder.compile(optimizer='adam', loss='mean_squared_error')
```

In [4]:

```
# Train model
history = autoencoder.fit(
    x_train, x_train,
    validation_data=(x_test, x_test),
```

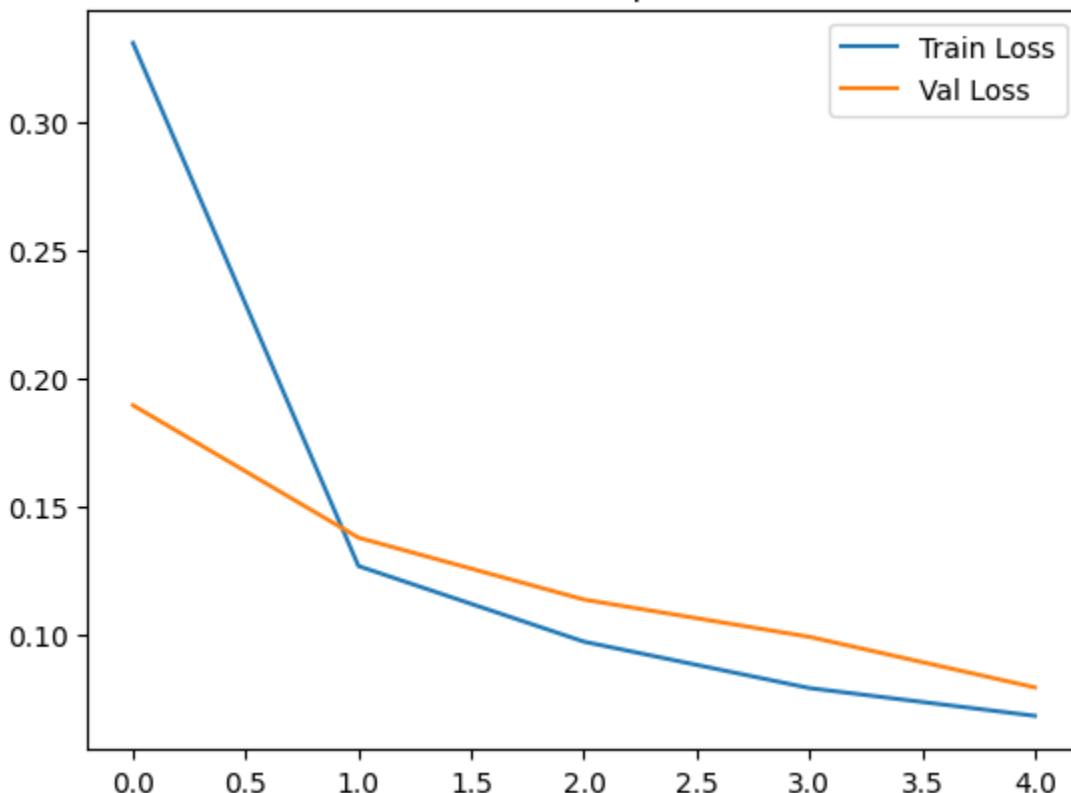
```
    epochs=5,  
    batch_size=128,  
    shuffle=True  
)
```

```
Epoch 1/5  
1777/1777 ━━━━━━━━ 30s 12ms/step - loss: 0.3311 - val_loss: 0.1895  
Epoch 2/5  
1777/1777 ━━━━━━ 21s 12ms/step - loss: 0.1266 - val_loss: 0.1377  
Epoch 3/5  
1777/1777 ━━━━━━ 41s 12ms/step - loss: 0.0971 - val_loss: 0.1135  
Epoch 4/5  
1777/1777 ━━━━━━ 21s 12ms/step - loss: 0.0789 - val_loss: 0.0989  
Epoch 5/5  
1777/1777 ━━━━━━ 22s 12ms/step - loss: 0.0681 - val_loss: 0.0792
```

In [5]:

```
# Plot training loss  
plt.plot(history.history['loss'], label='Train Loss')  
plt.plot(history.history['val_loss'], label='Val Loss')  
plt.legend()  
plt.title('Loss Over Epochs')  
plt.show()
```

Loss Over Epochs



In [6]:

```
# Reconstruction error  
predictions = autoencoder.predict(x_test)  
mse = np.mean(np.power(x_test - predictions, 2), axis=1)
```

```
1781/1781 ━━━━━━ 14s 7ms/step
```

In [7]:

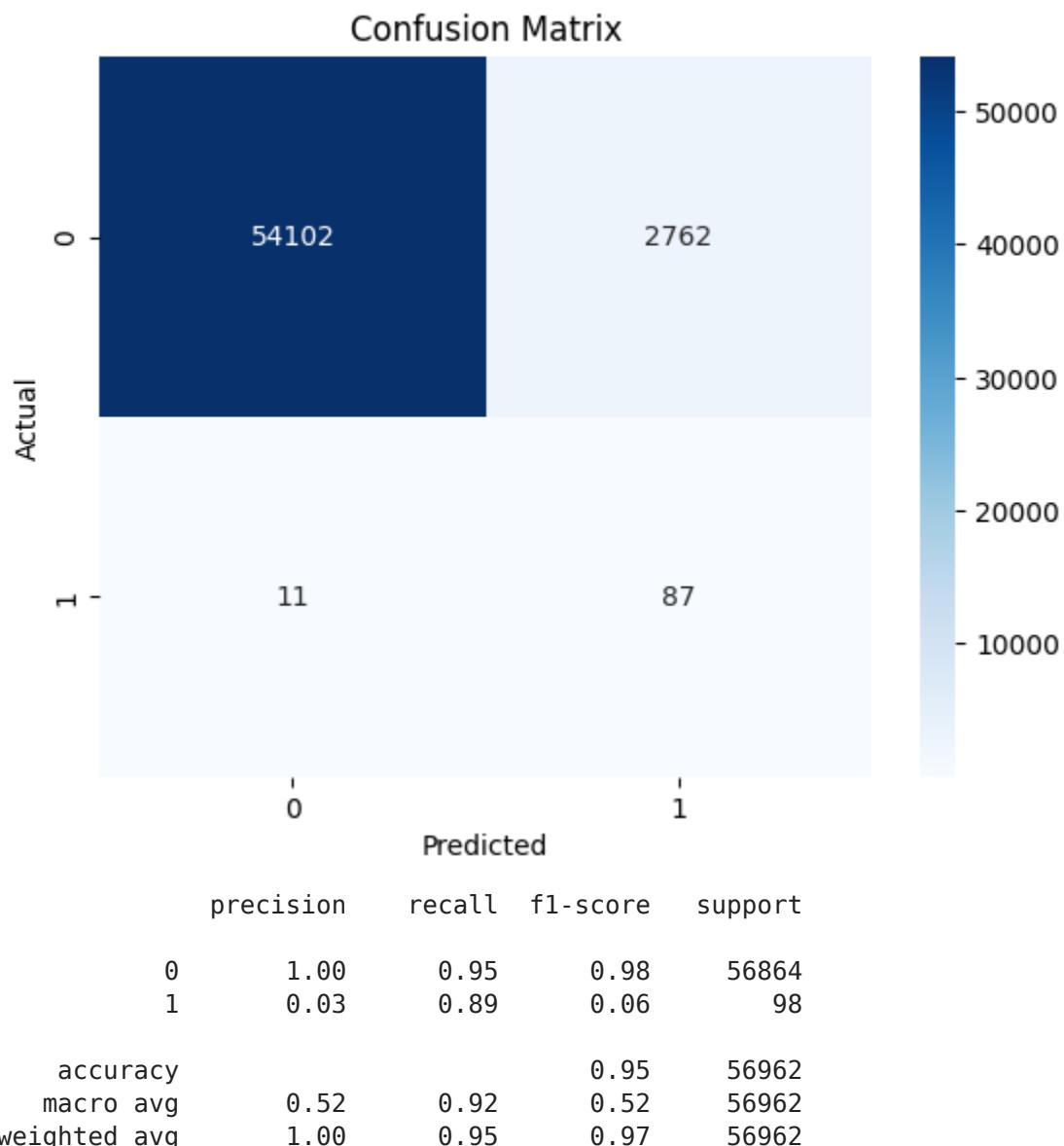
```
# Set threshold and detect anomalies  
threshold = np.percentile(mse, 95)
```

```
anomalies = mse > threshold
```

In [8]:

```
# Confusion matrix & report
cm = confusion_matrix(y_test, anomalies)
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix')
plt.show()

print(classification_report(y_test, anomalies))
```



In []: