In [1]:
```python
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
```

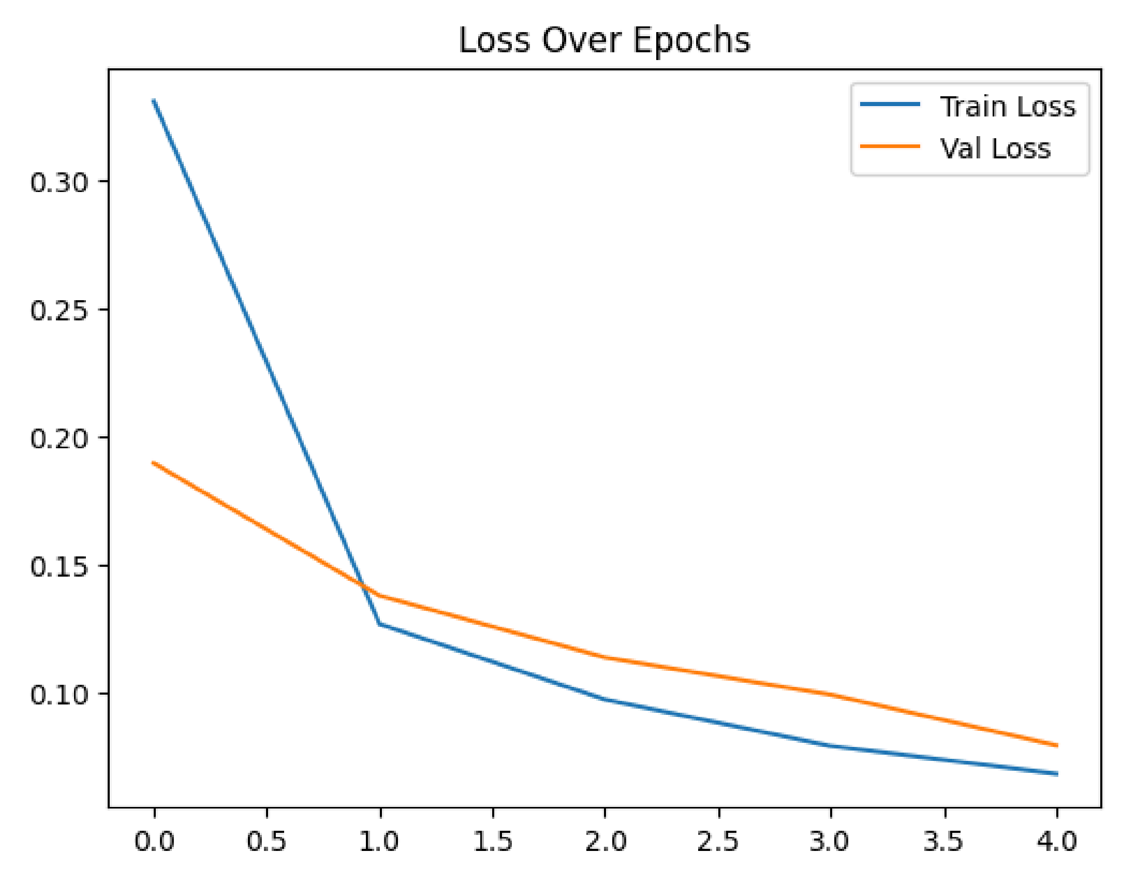
In [2]:
```python
# Load dataset
df = pd.read_csv("creditcard.csv")

# 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]:
```python
# 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]:
```python
# 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]:
```python
# 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()
```

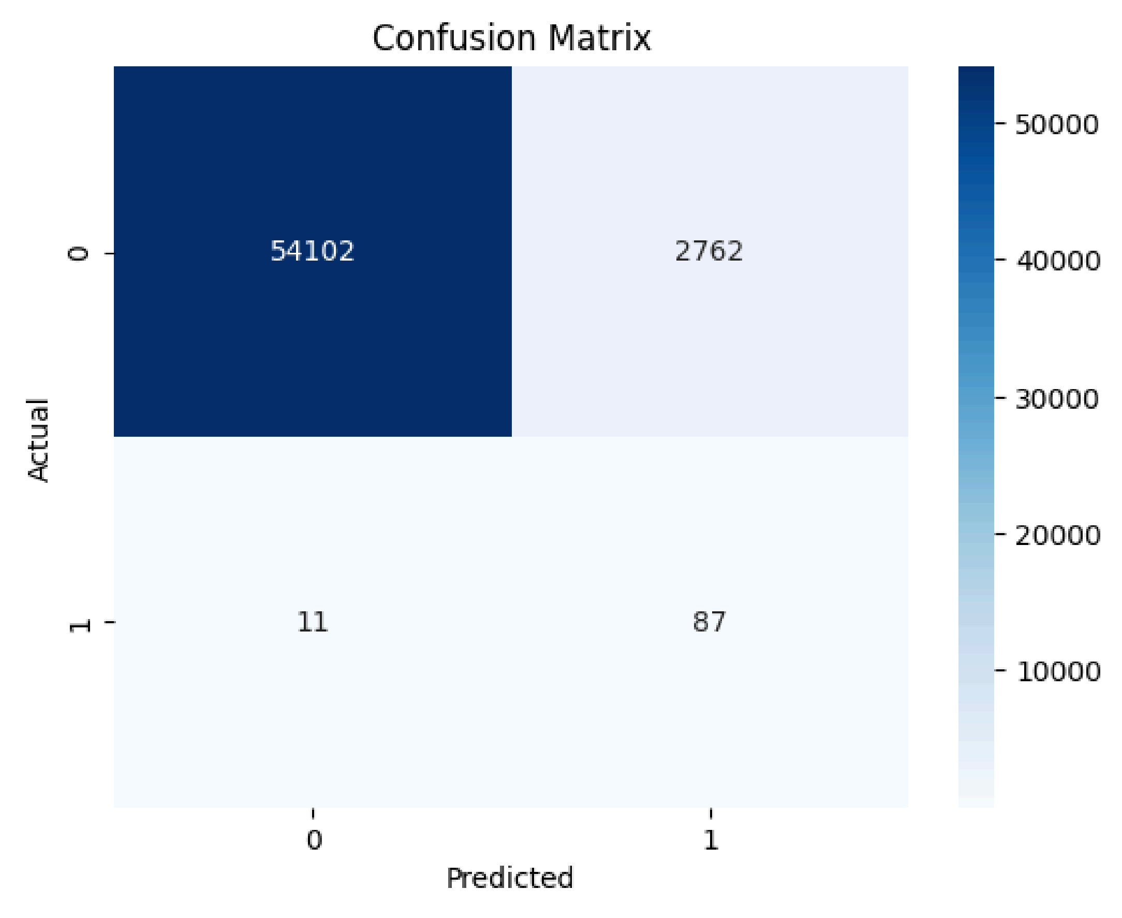


In [6]:
```python
# Reconstruction error
predictions = autoencoder.predict(x_test)
mse = np.mean(np.power(x_test - predictions, 2), axis=1)
```

```
1781/1781 ━━━━━━━━━━━━━━━━━━━━ 14s 7ms/step
```

In [7]:
```python
# Set threshold and detect anomalies
threshold = np.percentile(mse, 95)
anomalies = mse > threshold
```

In [8]:
```python
# 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))
```



```
              precision    recall  f1-score   support

           0       1.00      0.95      0.98     56864
           1       0.03      0.89      0.06        98

    accuracy                           0.95     56962
   macro avg       0.52      0.92      0.52     56962
```

```
weighted avg       1.00      0.95      0.97     56962
```

In [ ]: