Hands-On Assignment 4

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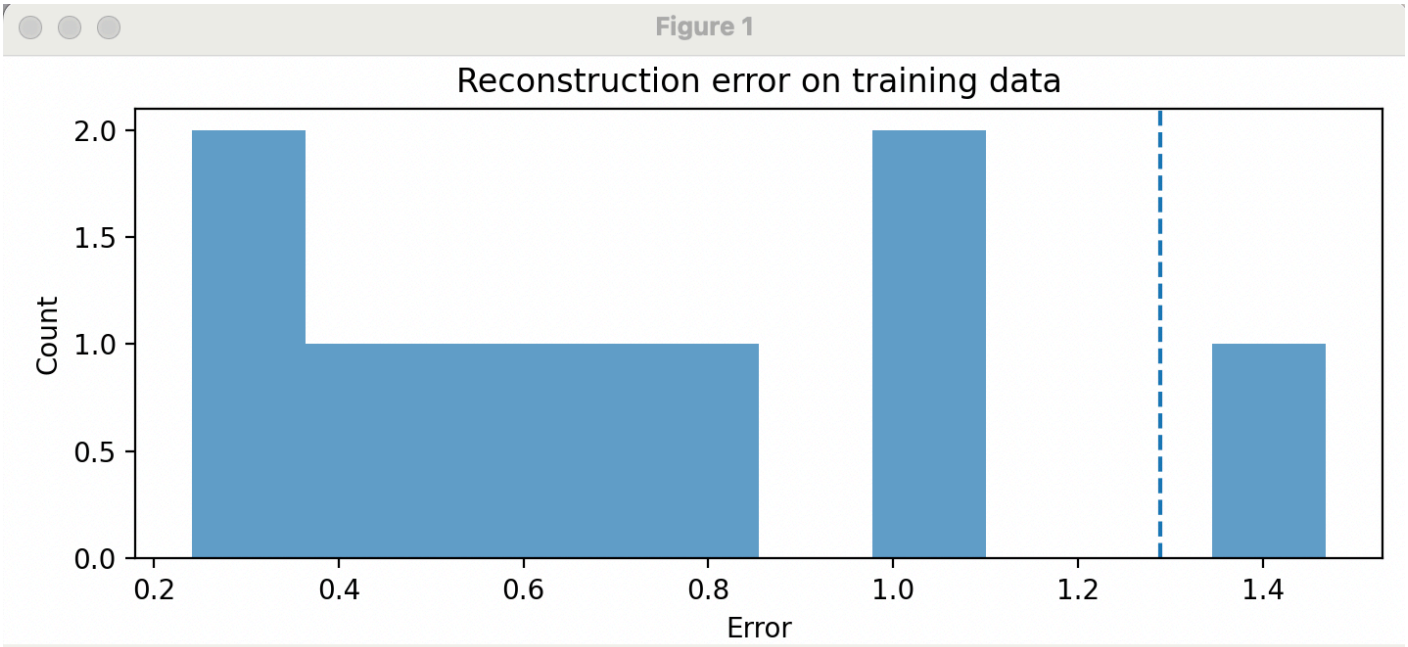
In this assignment, I built an unsupervised fraud detection system using a deep learning autoencoder. I prepared a small credit card transaction dataset and preprocessed it by separating the feature columns from the class label and scaling them with StandardScaler. The autoencoder was trained only on the input features, and the model learned to reconstruct normal patterns in the data. After training, reconstruction error values were calculated for both the training and test sets, and an anomaly threshold was selected from the distribution of the training errors. This allowed the model to flag transactions with unusually high reconstruction error as potential fraud cases.

One of the challenges in this assignment was working with an unsupervised model that does not directly use labels during training. Because the autoencoder relies on reconstruction patterns rather than explicit fraud labels, I had to carefully choose a threshold for identifying anomalies and ensure that the dataset was clean and consistently formatted. Managing the environment setup, installing the required deep learning libraries, and resolving version conflicts also required extra attention. Once everything was configured properly, the autoencoder trained smoothly and produced a classification report and confusion matrix that reflected how well the reconstruction-based approach could separate normal transactions from fraudulent ones.

Screenshot



MSCS633_Fraud_PyOD — Python fraud_autoencoder_pyod.py — 101×27

```
(.venv) haerikyoung@MacBook-Air-3 MSCS633_Fraud_PyOD % source .venv/bin/activate
python fraud_autoencoder_pyod.py

Loading dataset...
Dataset shape: (12, 6)
Class distribution:
Class
0    8
1    4
Name: count, dtype: int64
Training autoencoder...
Anomaly threshold (95th percentile): 1.288810

Classification report (1 = fraud, 0 = normal):
              precision    recall  f1-score   support

           0     0.5000    0.5000    0.5000         2
           1     0.0000    0.0000    0.0000         1

    accuracy                         0.3333         3
   macro avg     0.2500    0.2500    0.2500         3
weighted avg     0.3333    0.3333    0.3333         3

Confusion matrix:
[[1 1]
 [1 0]]
```

Github

https://github.com/hkyoung38554/MSCS633_Assignment4