

# **Nexus-S1 September completion presentation**

**N08: Time Series Anomaly Detection**

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**Joining Date: June 17th, 2024**

1. In this research, comprehensive analysis of unsupervised anomaly detection techniques applied to univariate time series data, using NAB dataset focusing on machine temperature forecasting within the industrial domain.
2. Various methods were implemented and evaluated using open-source libraries, including PyOD, sklearn, and STUMPY and DeepOD.

Method	Type
LOF (Local Outlier Factor)	Statistical-based
HBOS (Histogram-Based Outlier Score)	Proximity-based
KNN (k-Nearest Neighbors)	Proximity-based
PCA (Principal Component Analysis)	Linear-based
MCD (Minimum Covariance Determinant)	Linear-based
LSCP (Locally Selective Combination of Parallel Outliers)	Ensemble-based
LSTM (Long Short-Term Memory)	Deep Learning-based
AE (Autoencoder)	Deep Learning-based
DBSCAN (Density-Based Spatial Clustering)	Clustering-based
K-means	Clustering-based
Gaussian Mixture Model (GMM)	Statistical-based
Isolation Forest	Ensemble-based
Matrix Profile	Time-series based

# Results

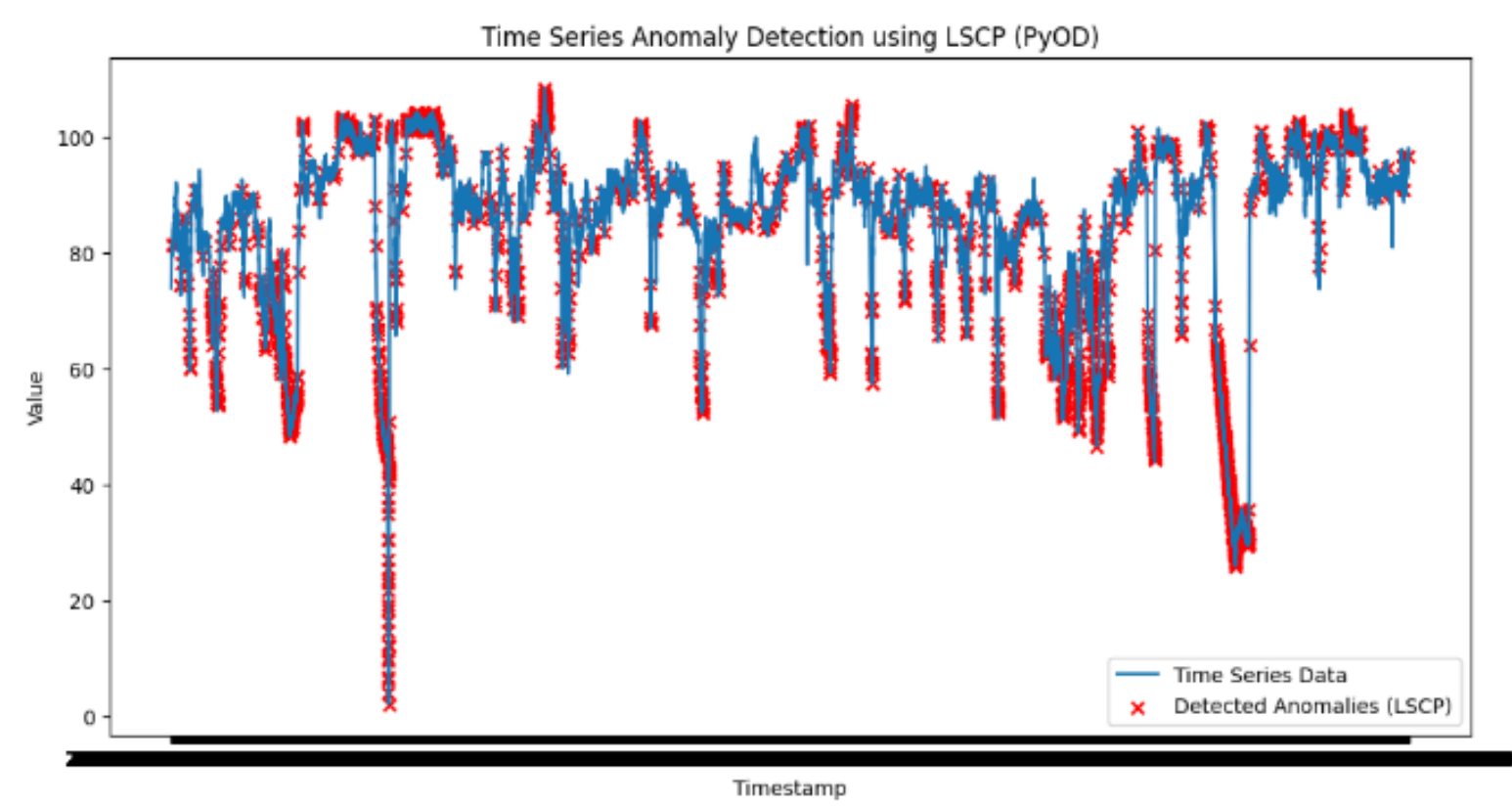


Figure 4: Anomaly plot for LSCP

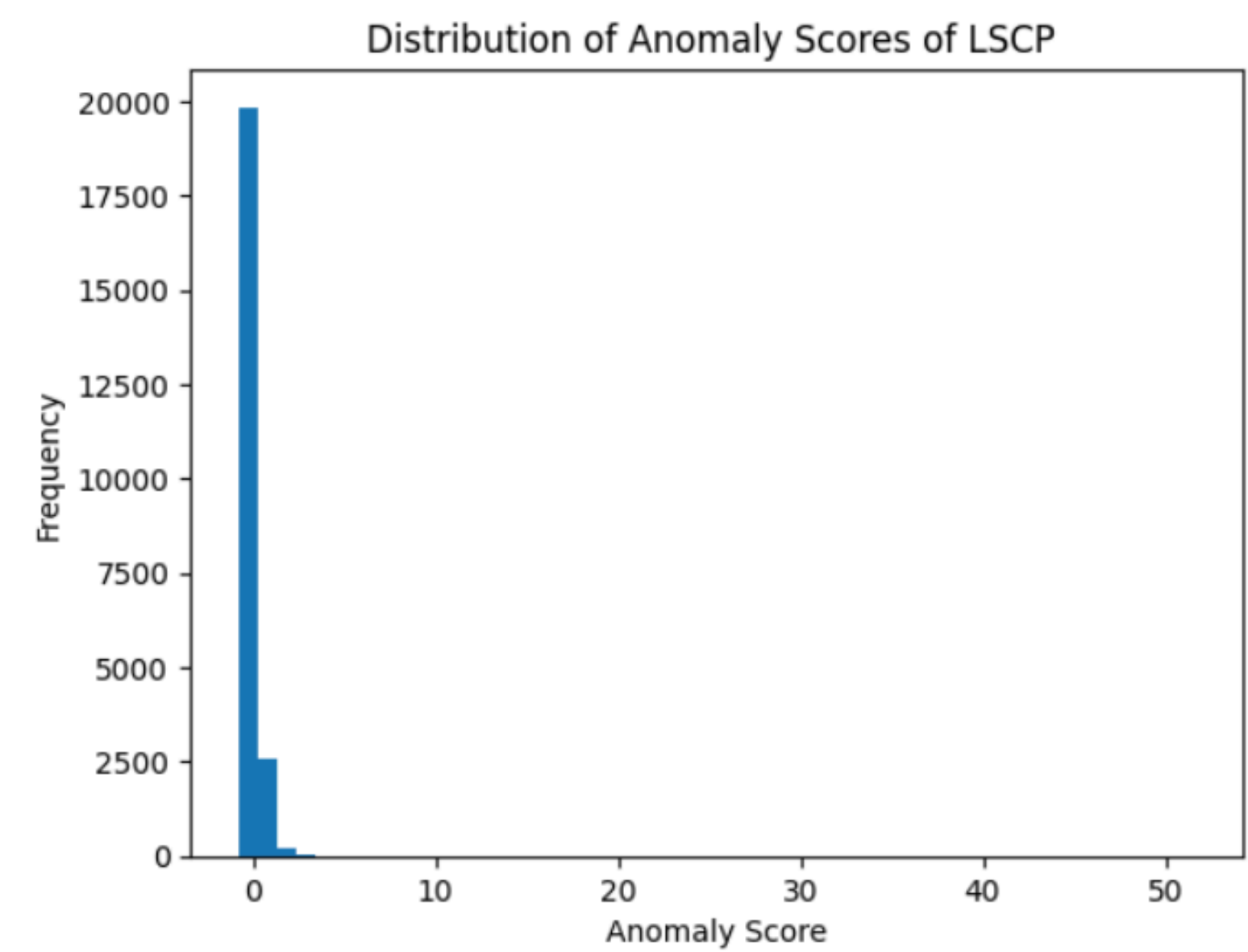


Figure 5: Anomaly distribution of LSCP

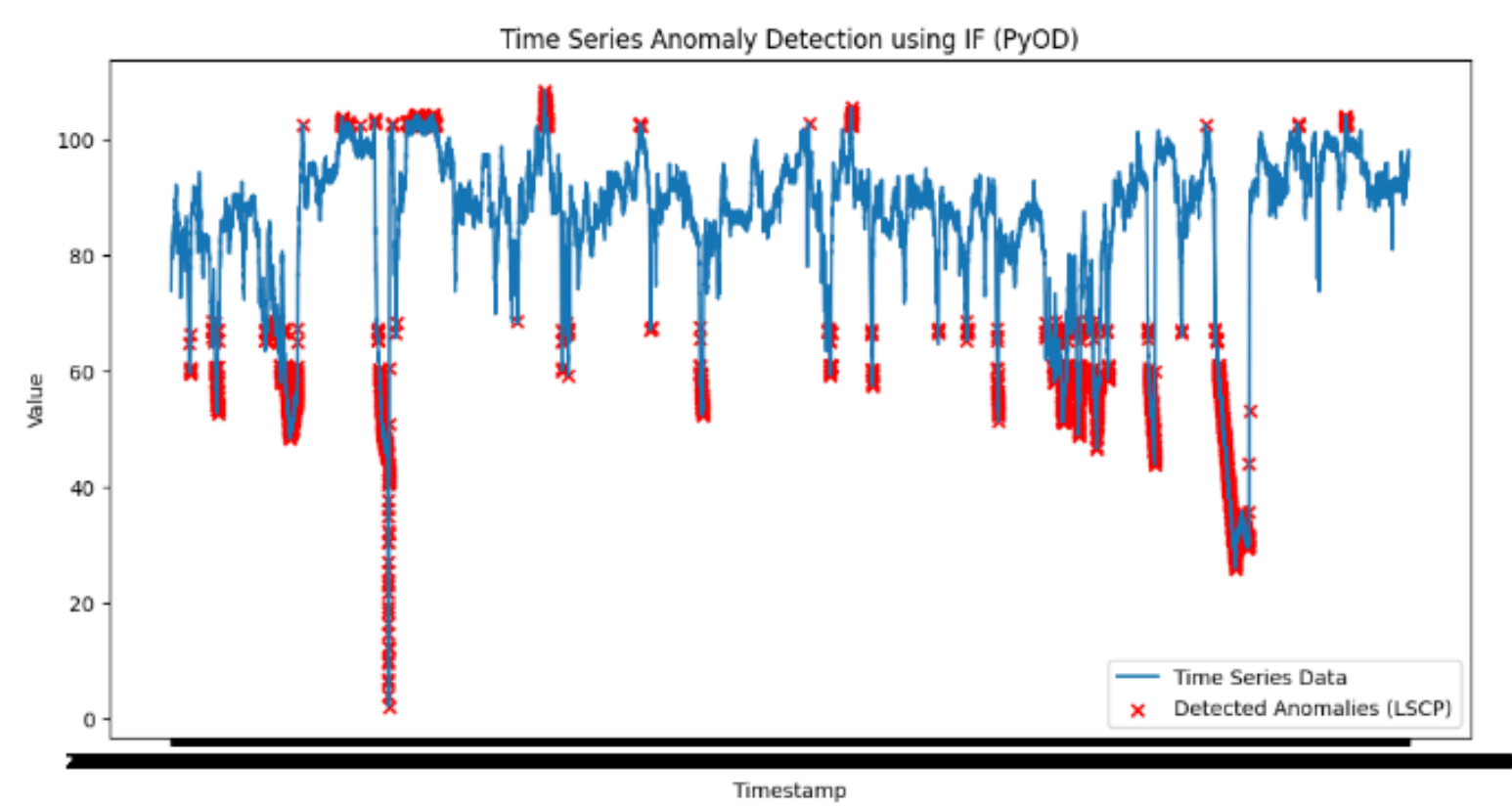


Figure 6: Anomaly plot for IF

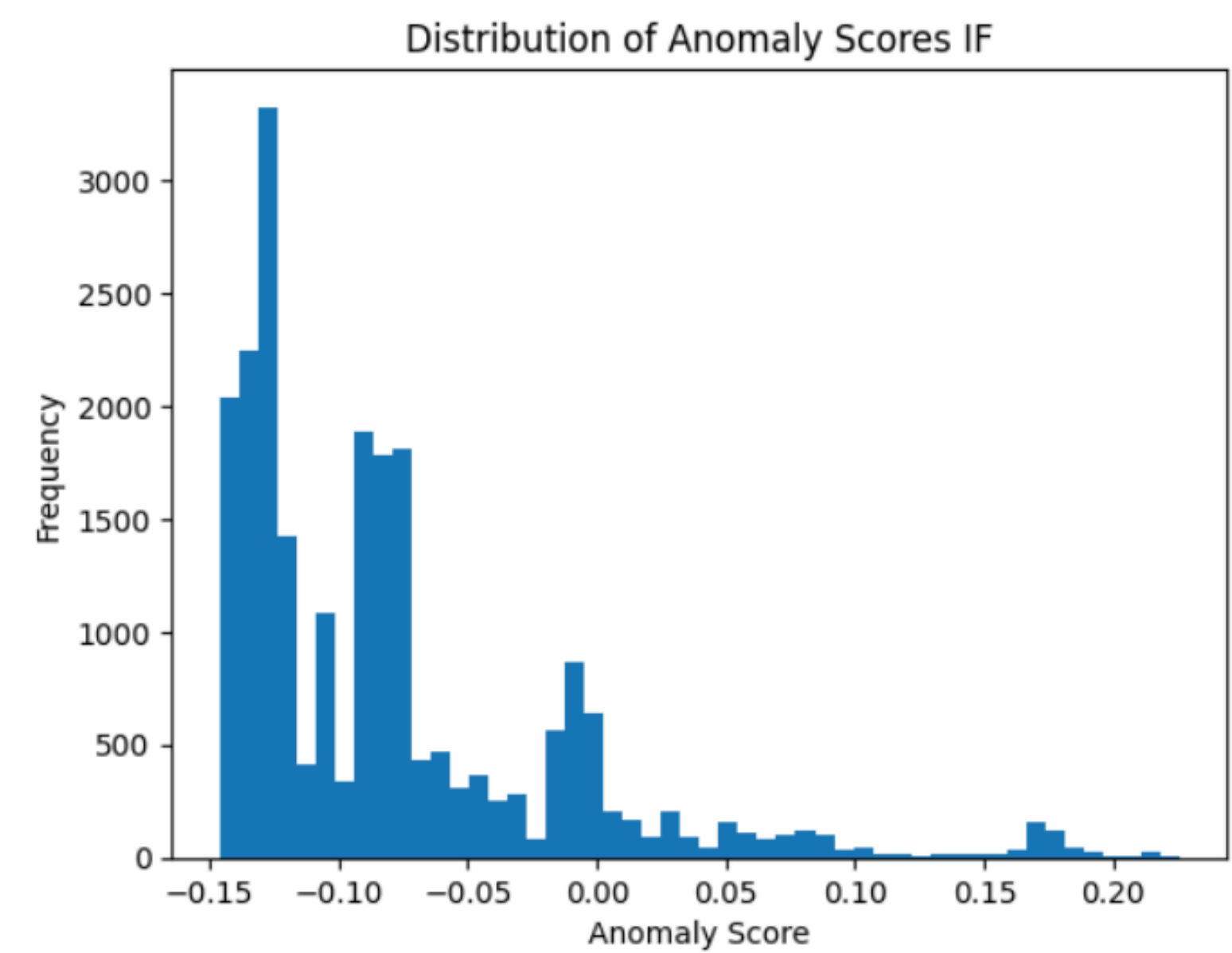


Figure 7: Anomaly distribution of IF

# Results

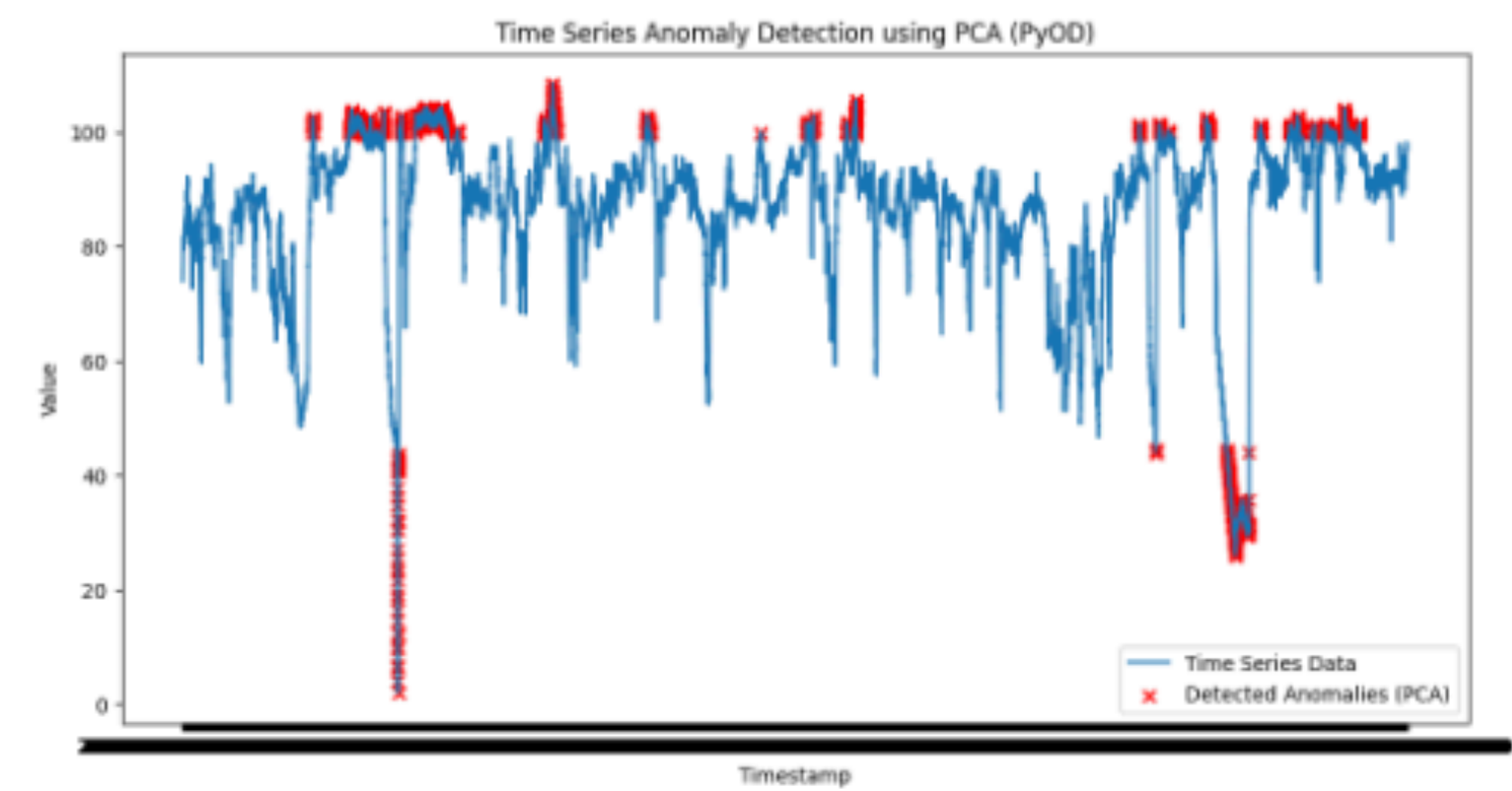


Figure 16: Anomaly plot for PCA

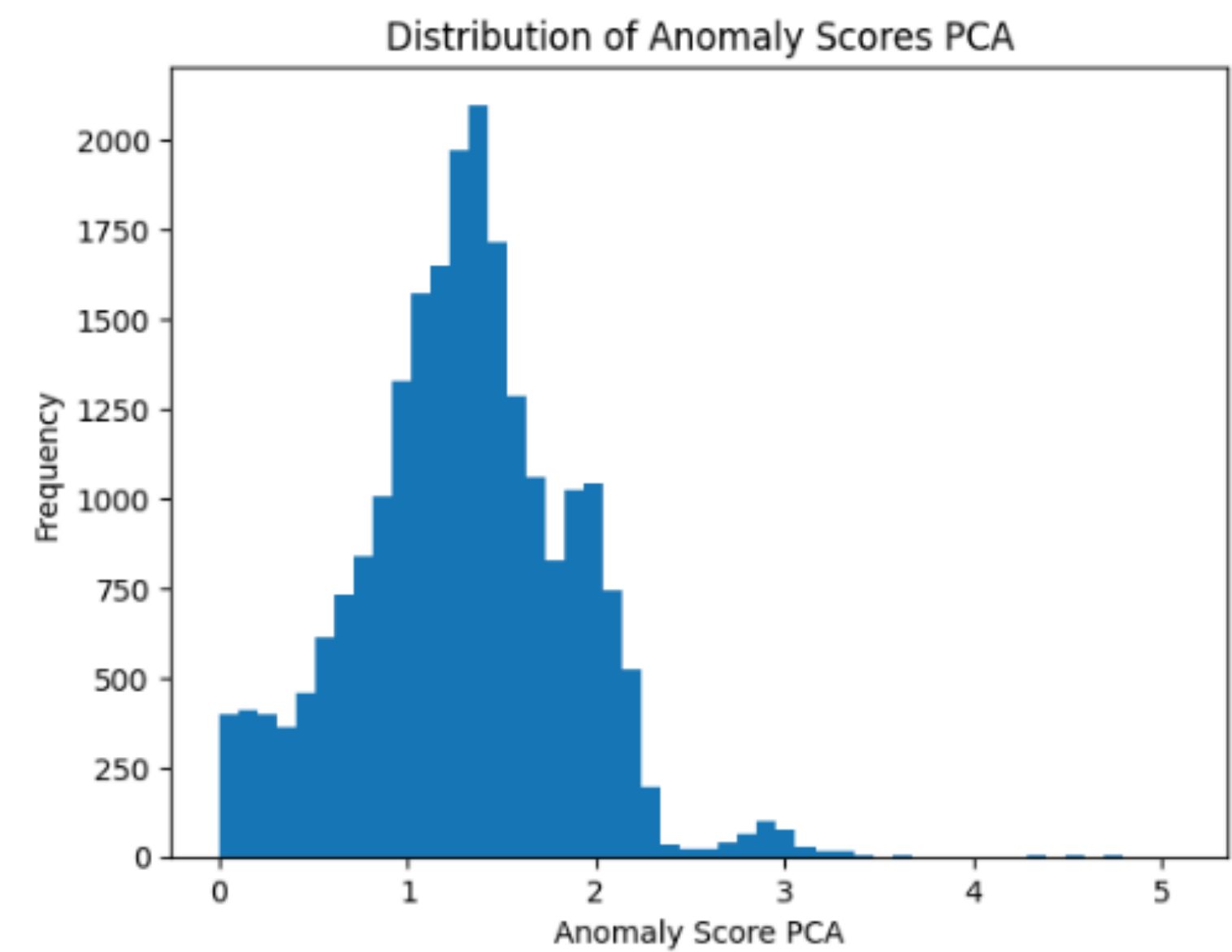


Figure 17: Anomaly distribution of PCA

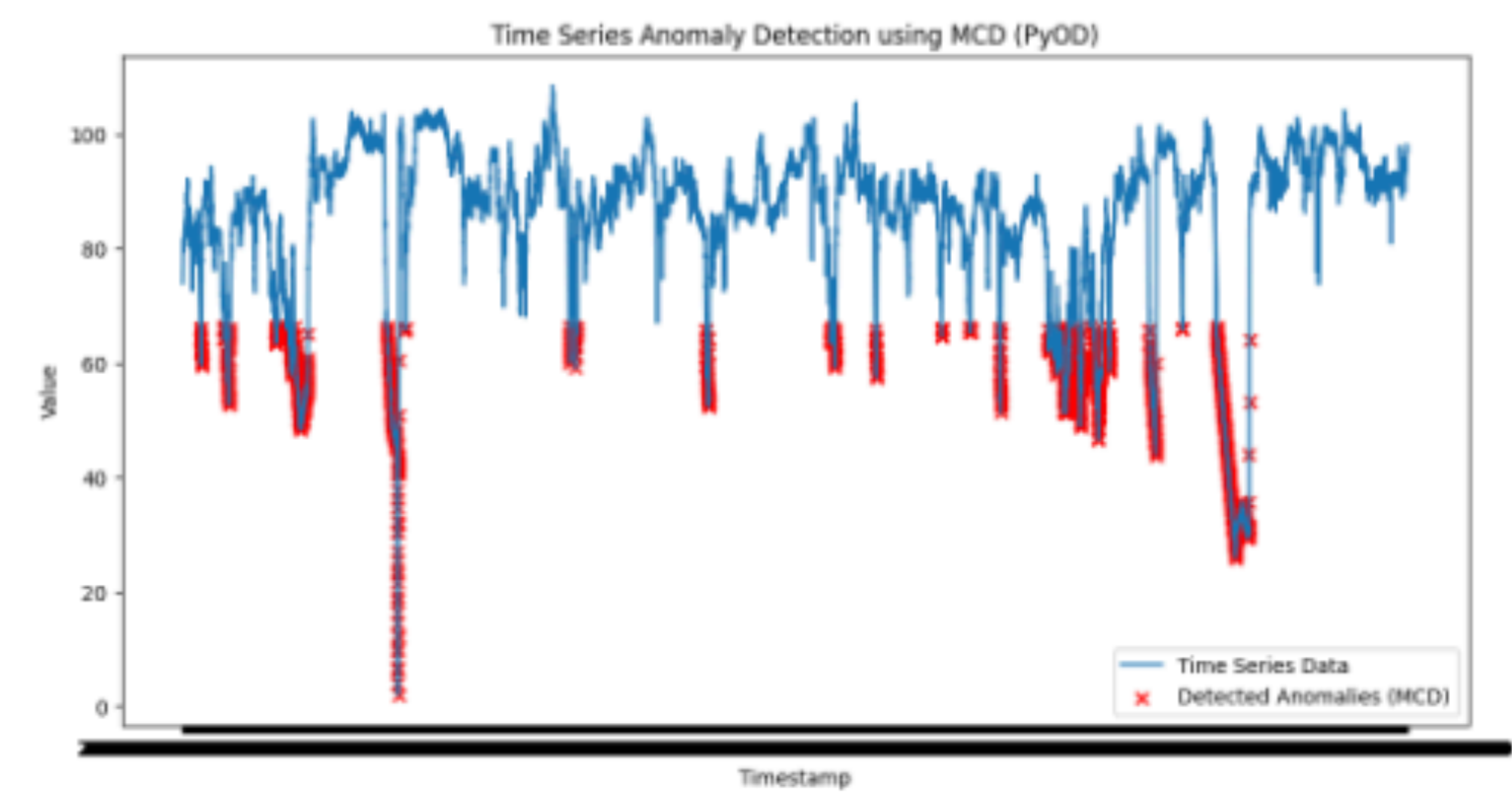


Figure 18: Anomaly plot for MCD

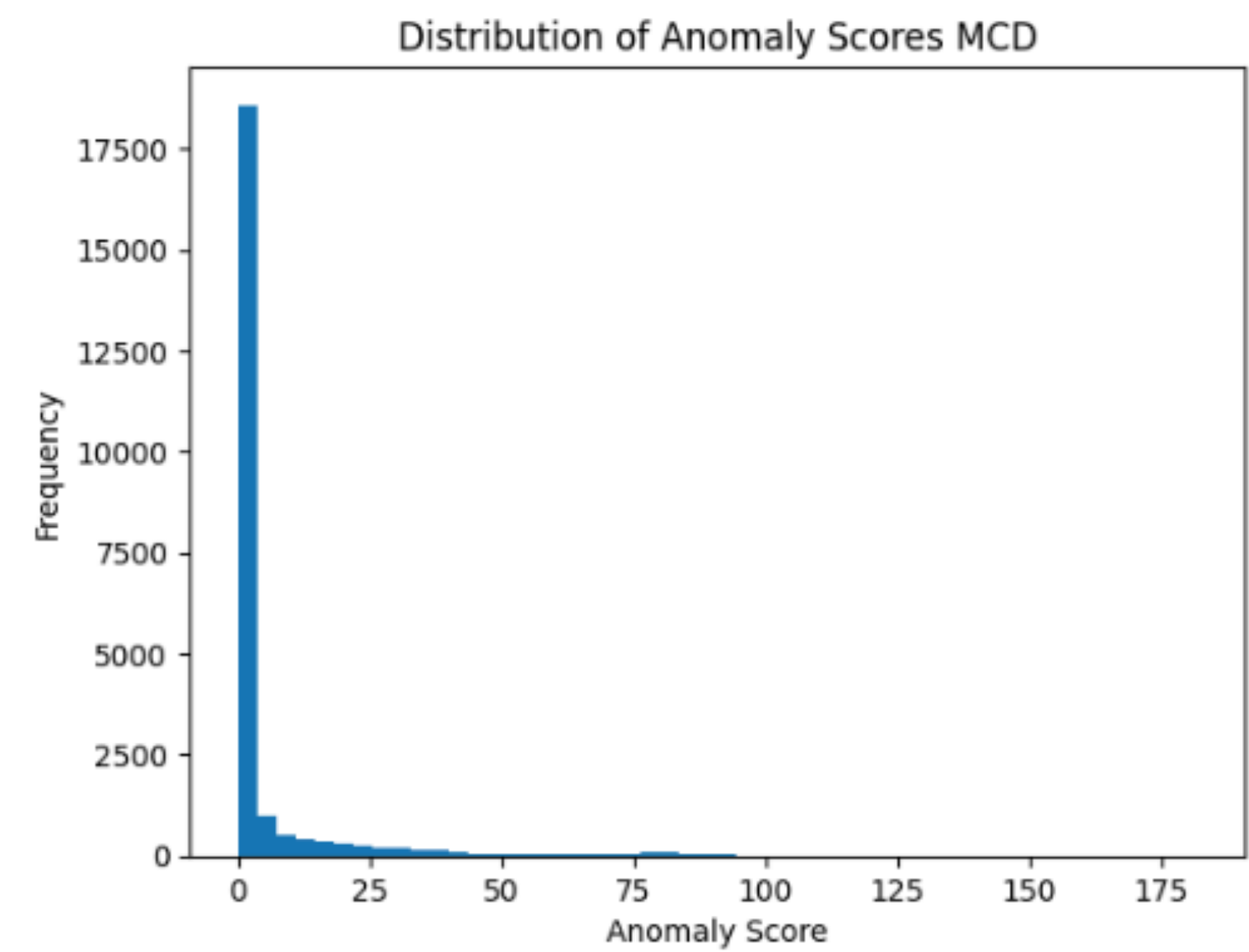


Figure 19: Anomaly distribution of PCA

# Results

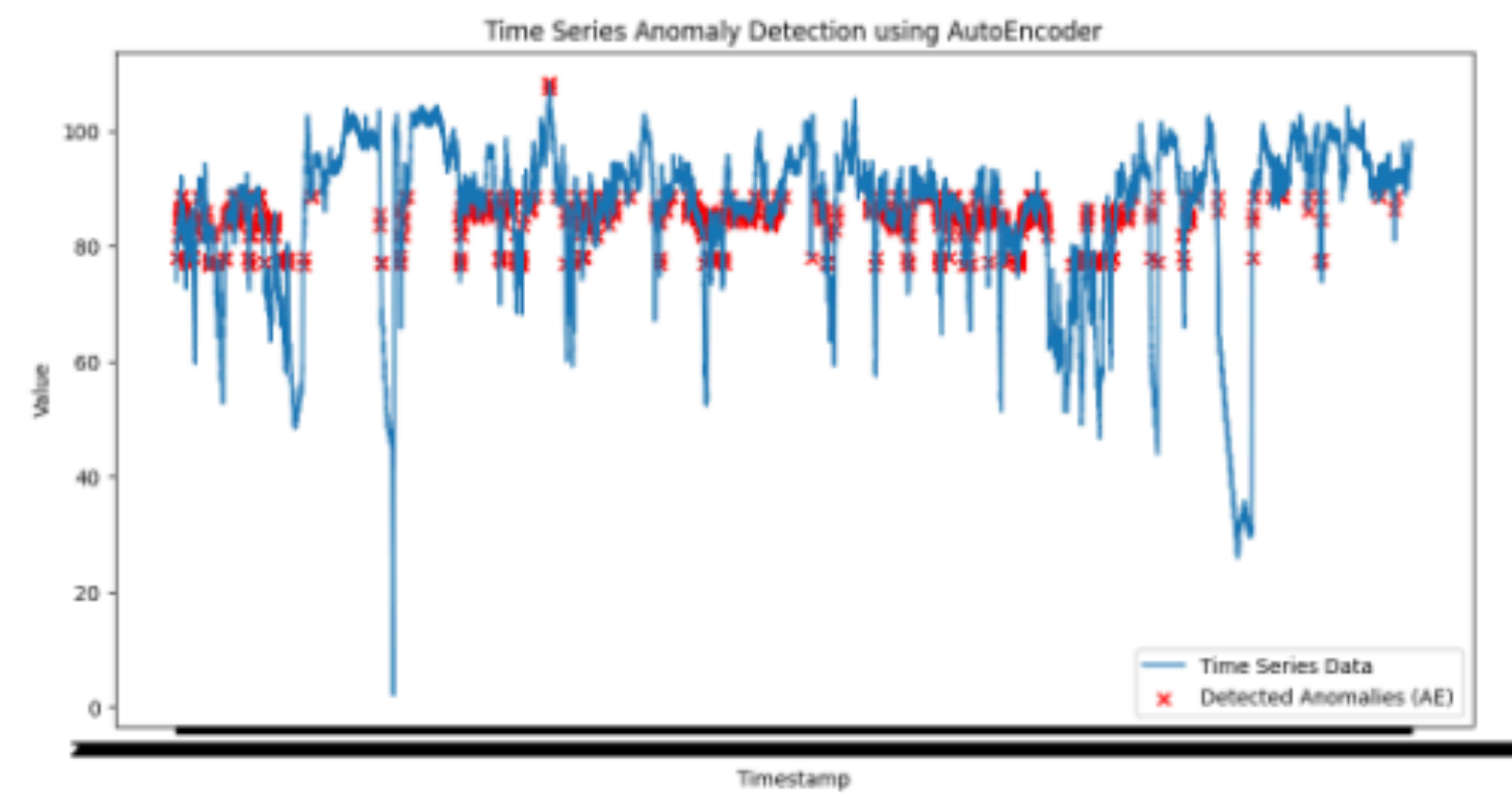


Figure 27: Anomaly plot for AE

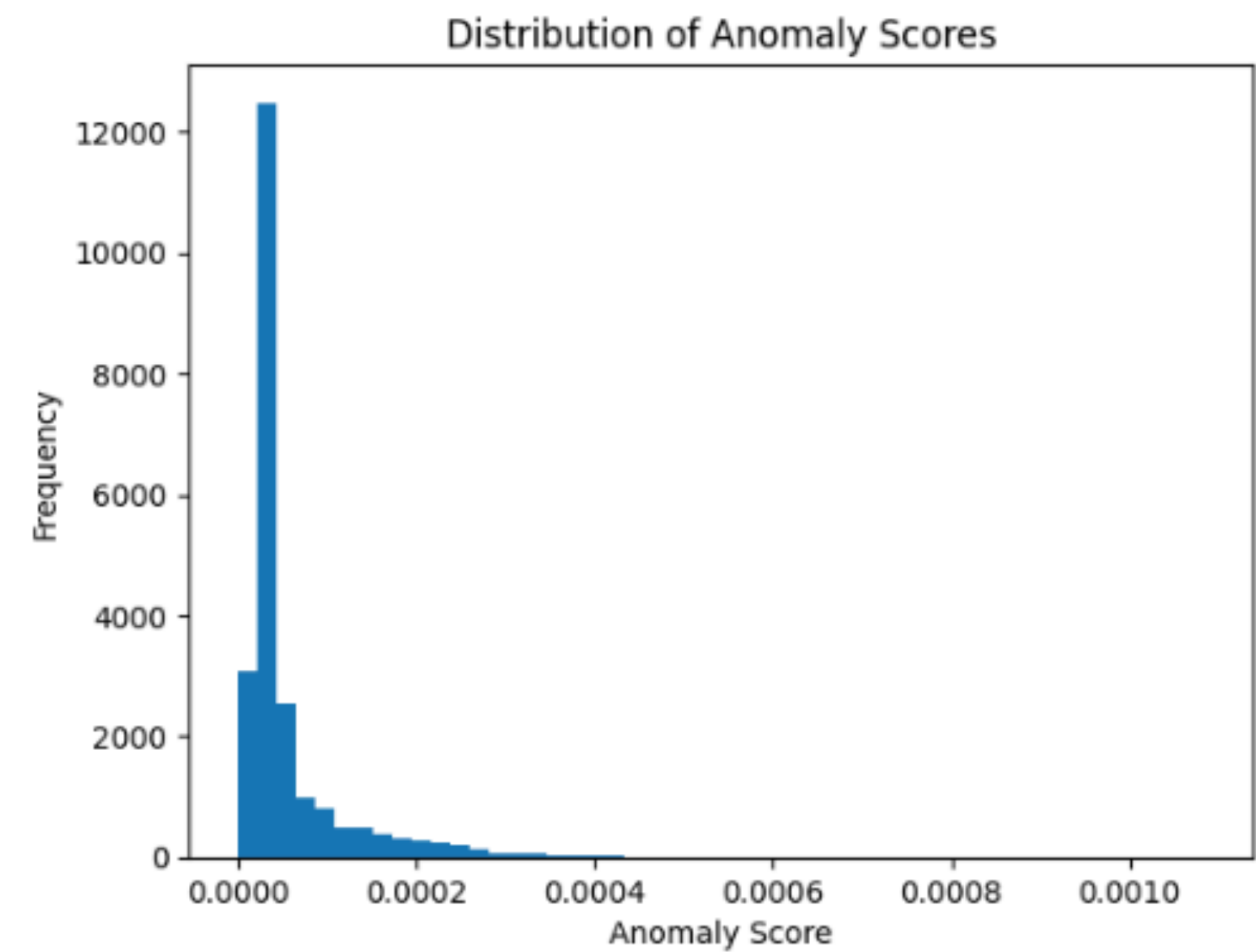


Figure 28: Anomaly distribution of AE

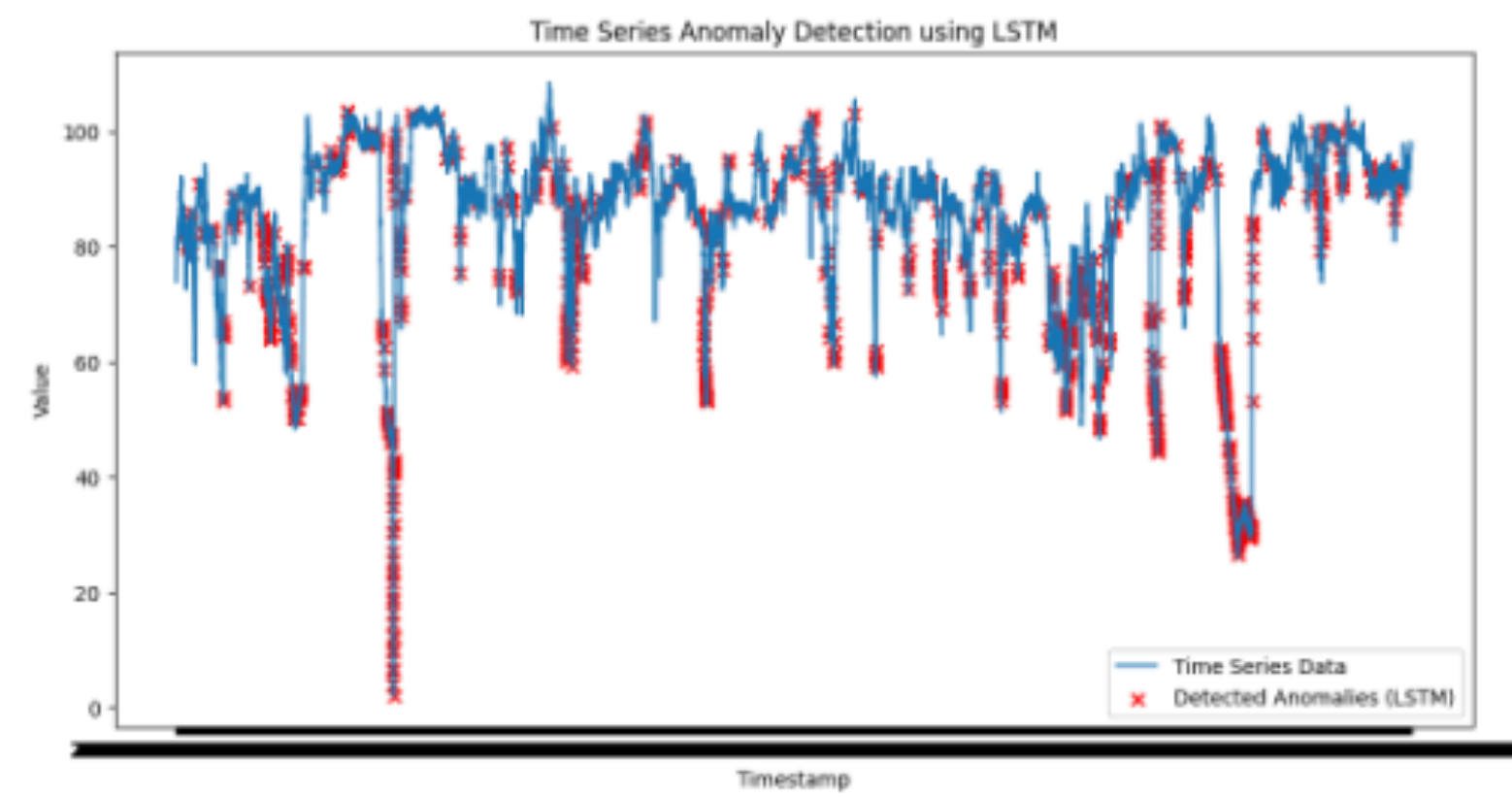


Figure 29: Anomaly plot for LSTM

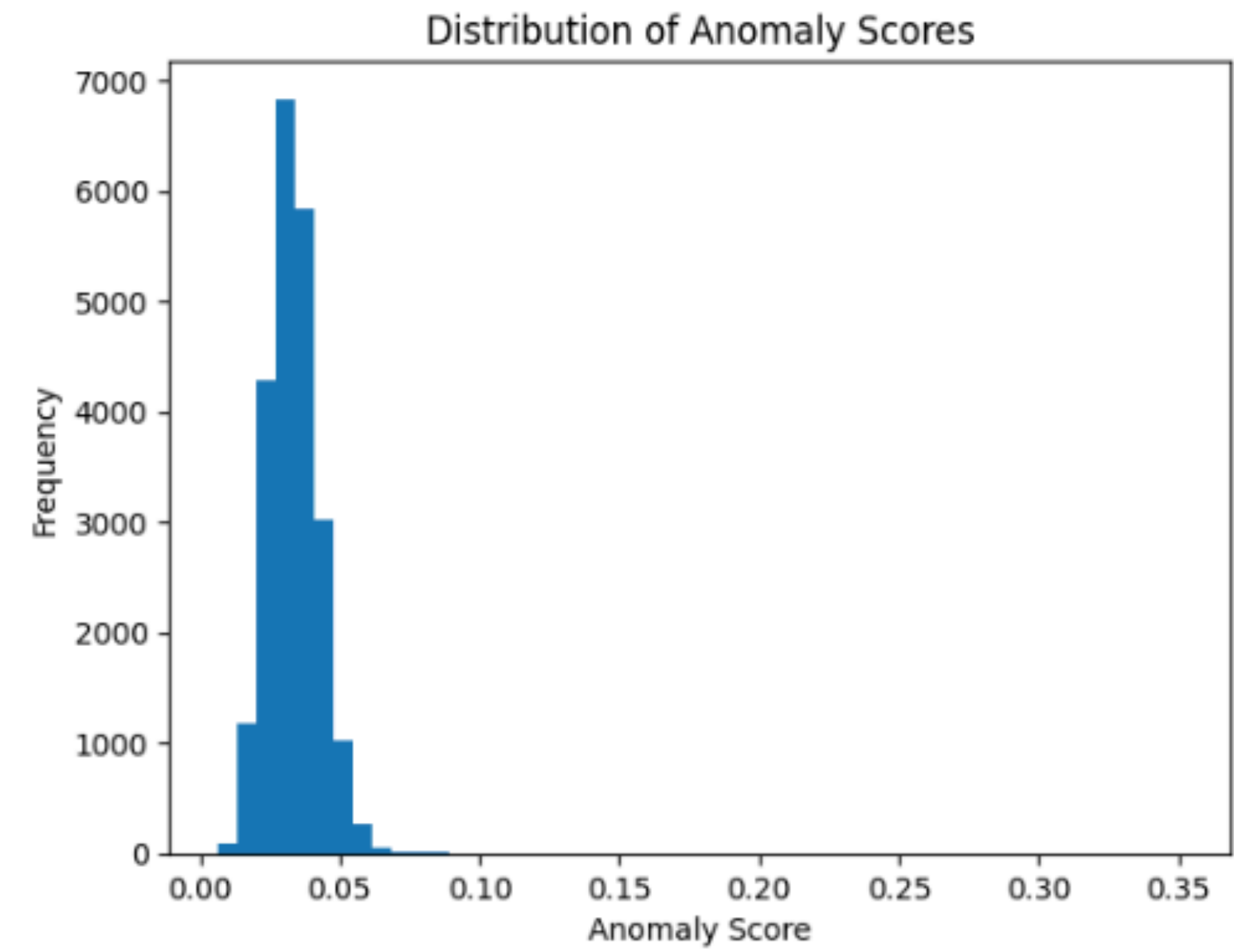


Figure 30: Anomaly distribution of LSTM



# Results

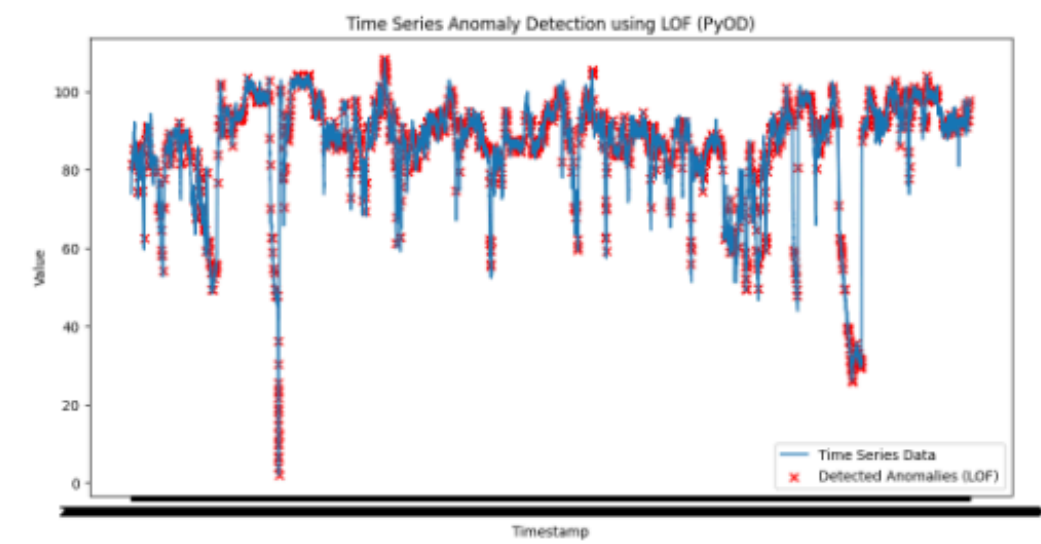


Figure 9: Anomaly plot for LOF

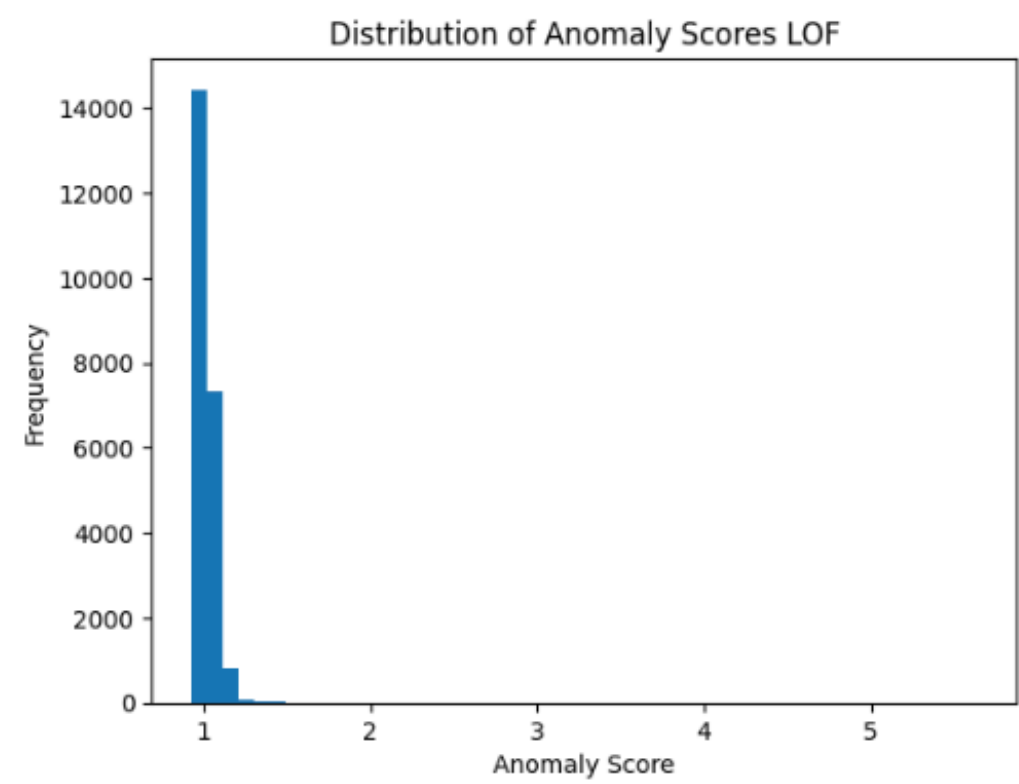


Figure 10: Anomaly distribution of LOF

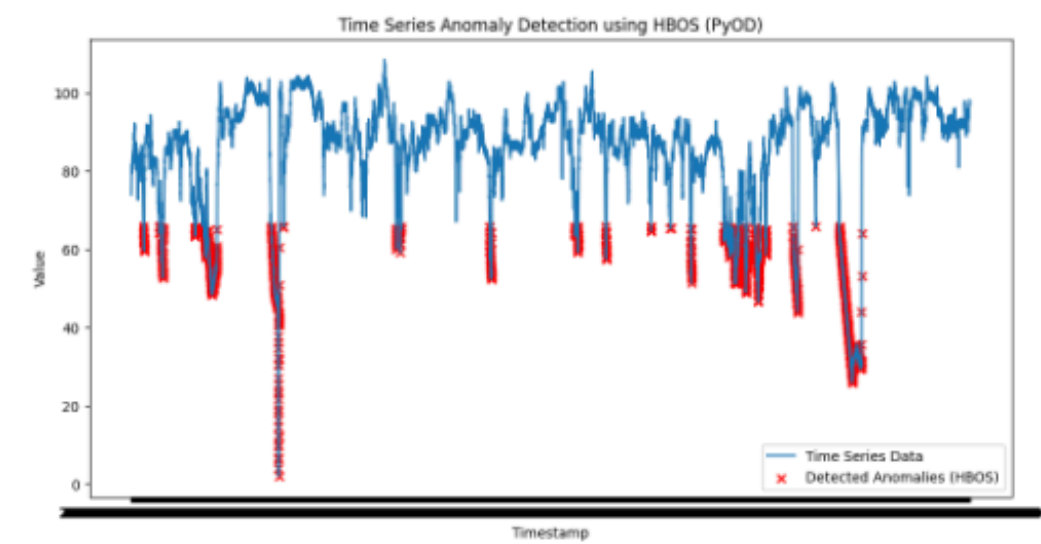


Figure 11: Anomaly plot for HBOS

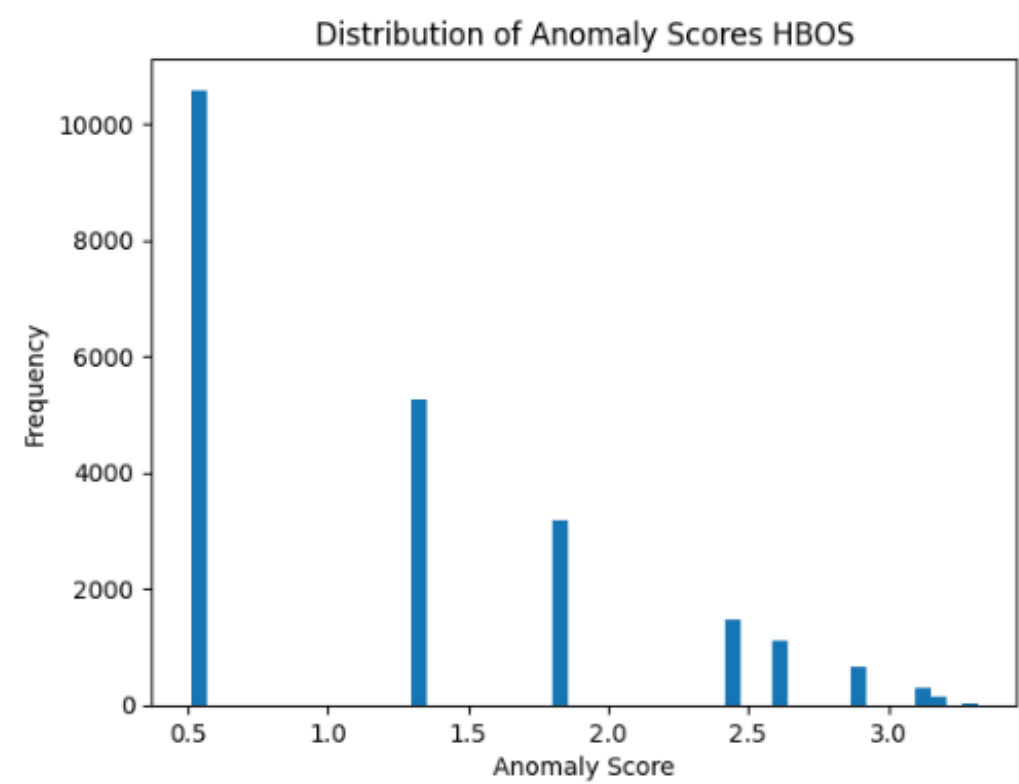


Figure 12: Anomaly distribution of HBOS

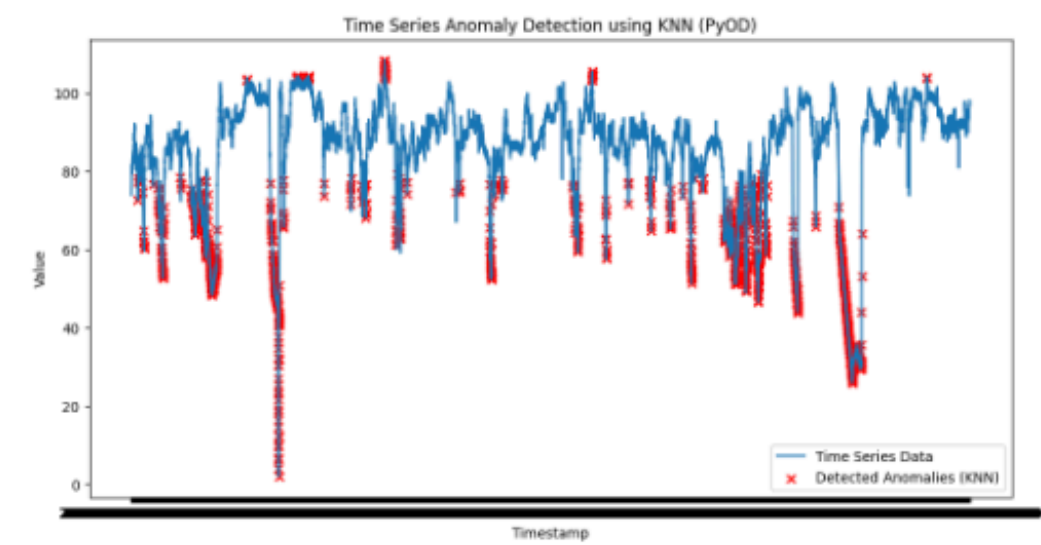


Figure 13: Anomaly plot for KNN

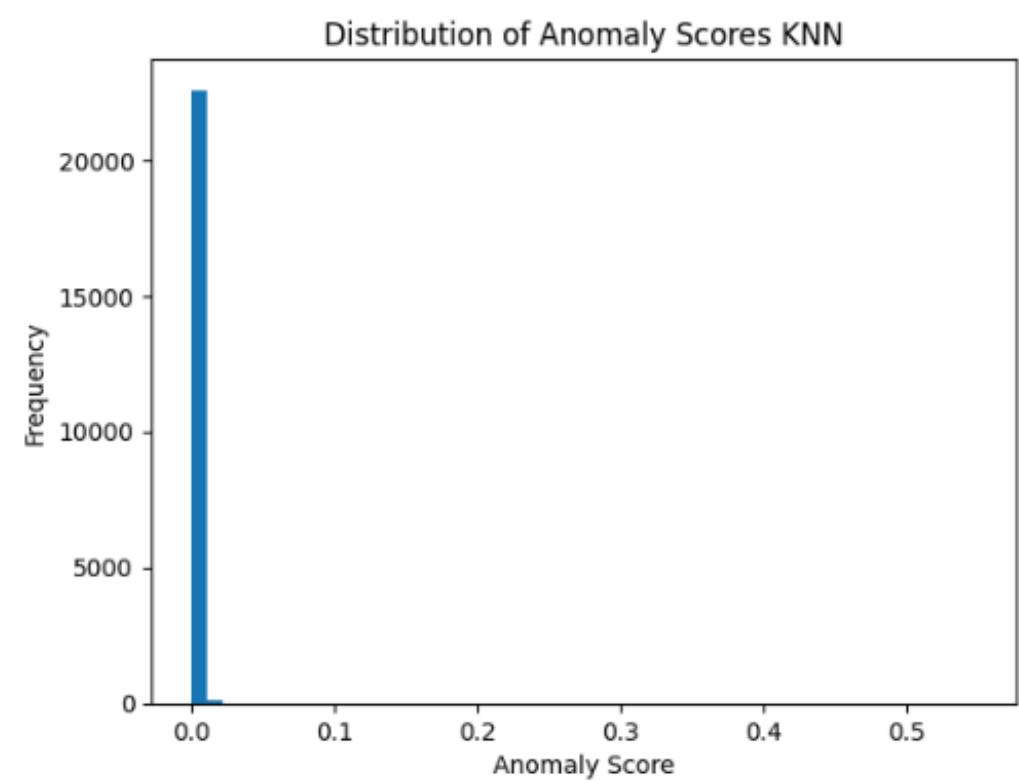


Figure 14: Anomaly distribution of KNN

# Results

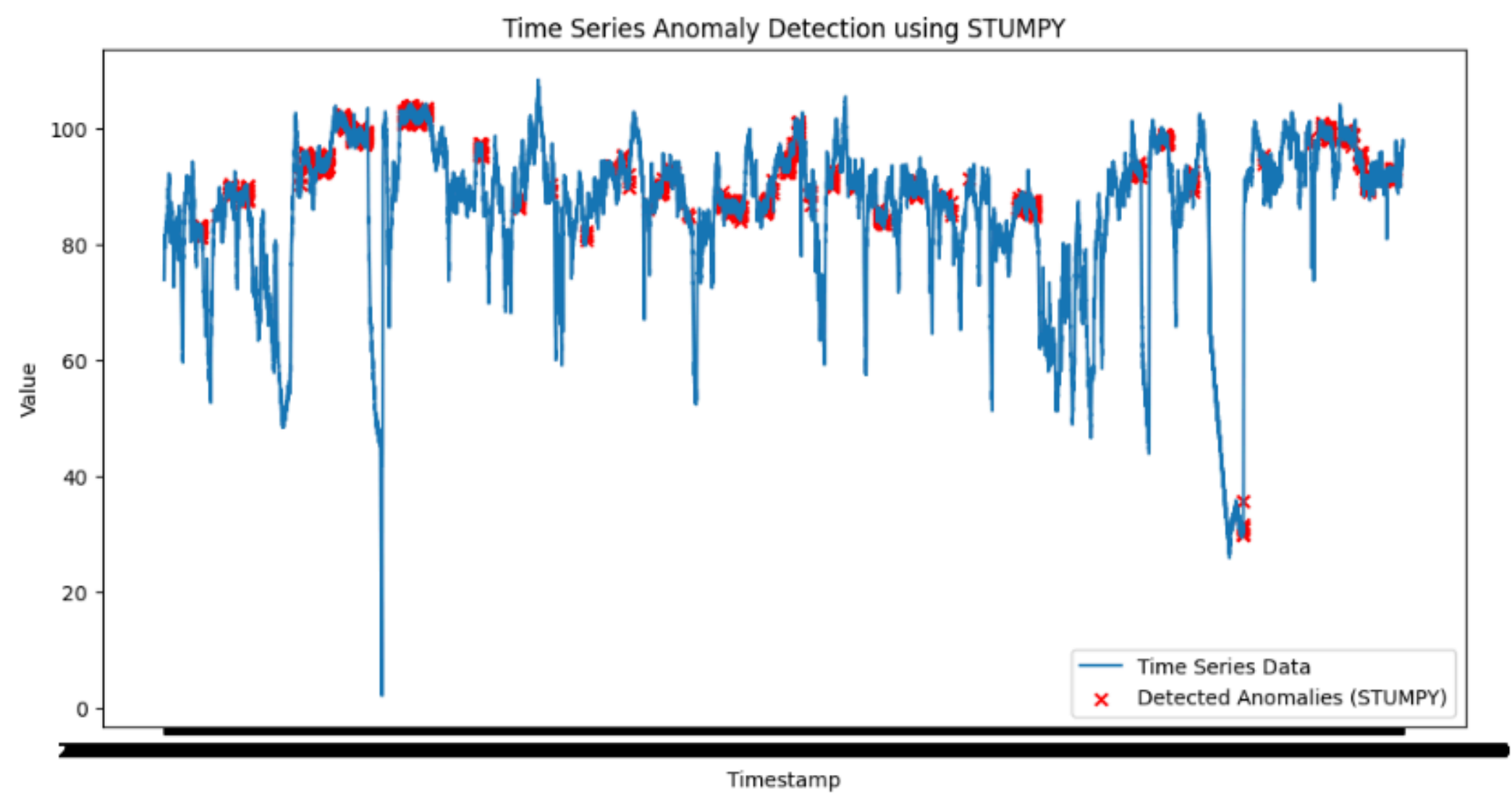


Figure 25: Anomaly plot for matrix profile

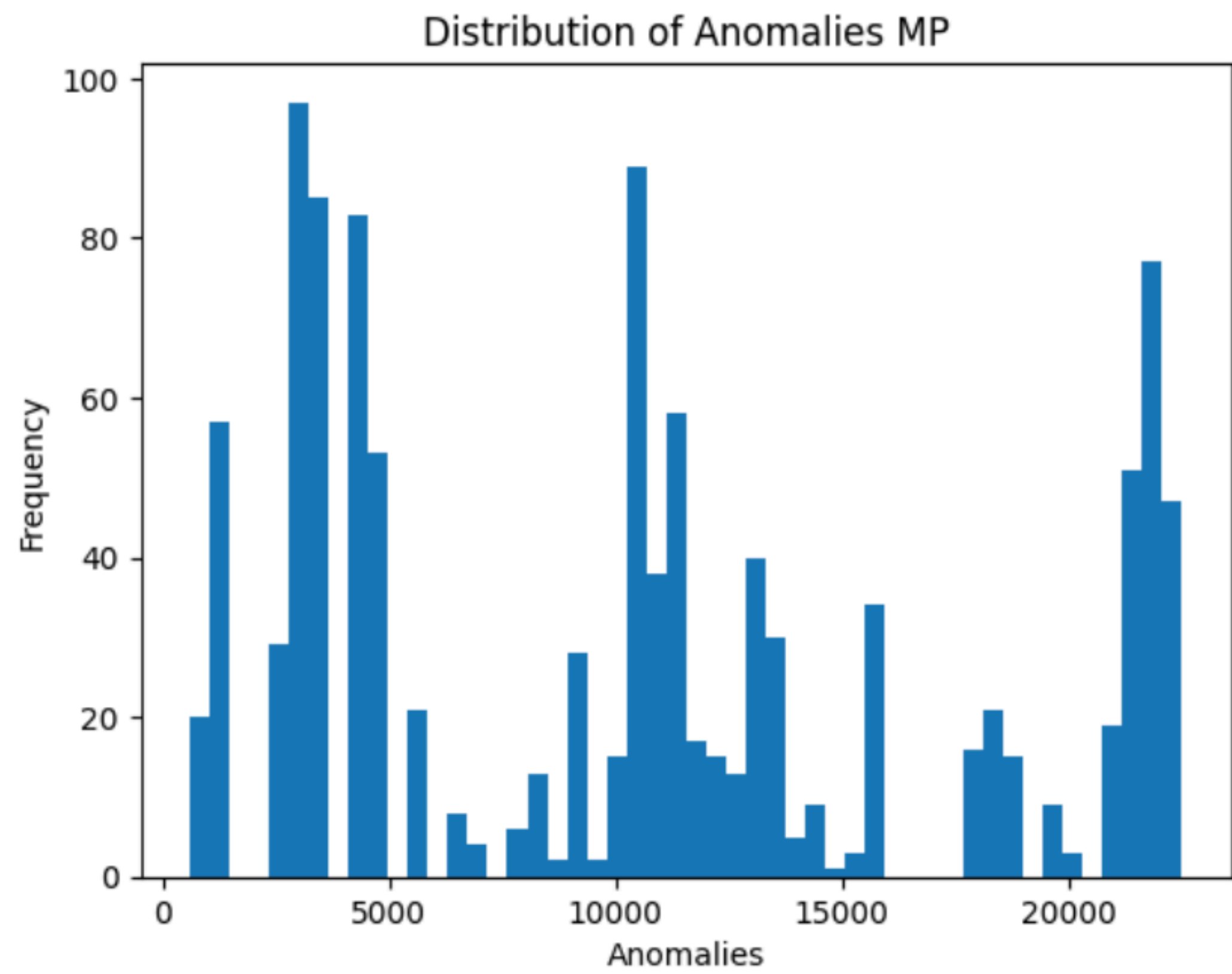


Figure 26: Anomaly distribution of matrix profile



# Results

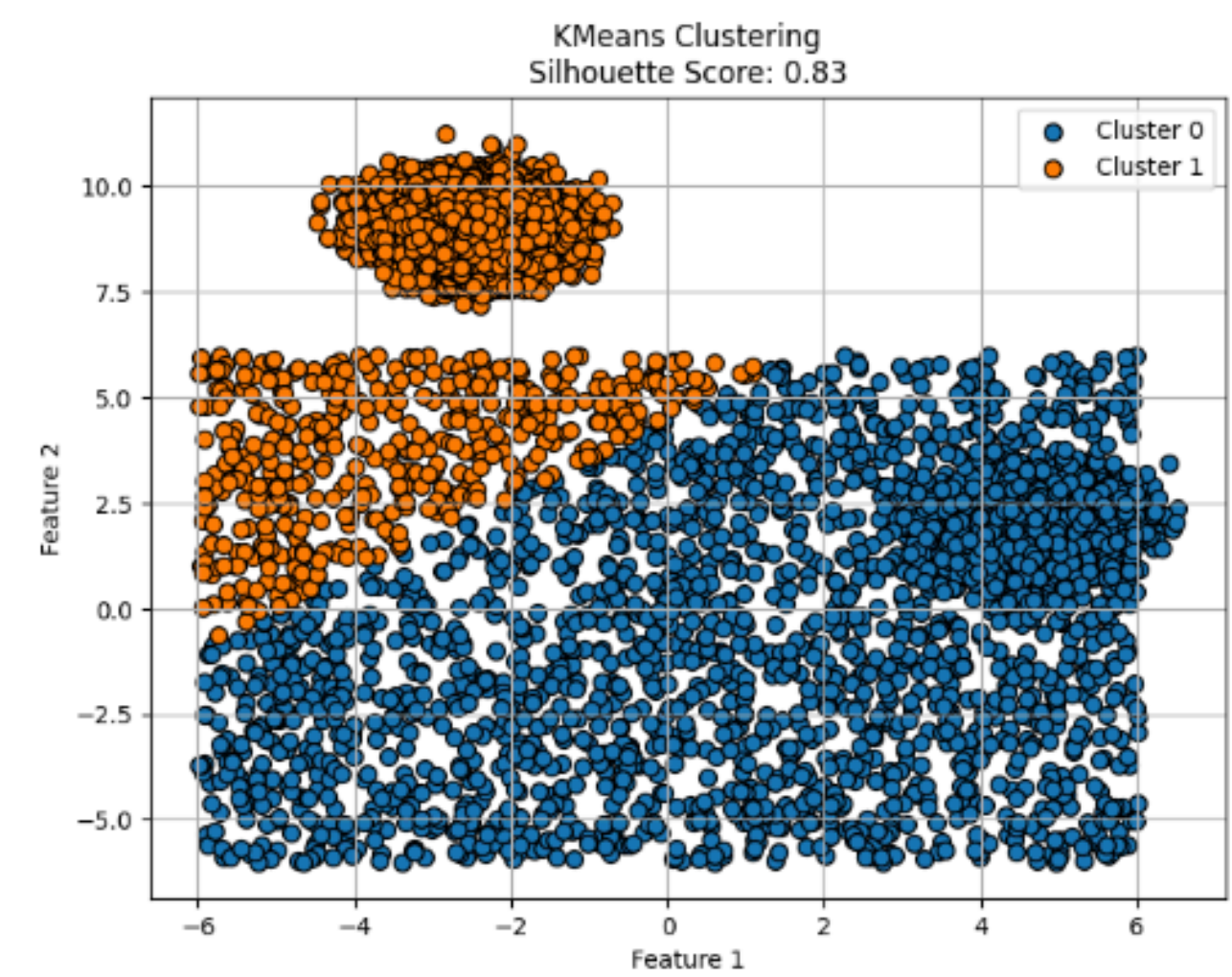


Figure 21: KMeans Score

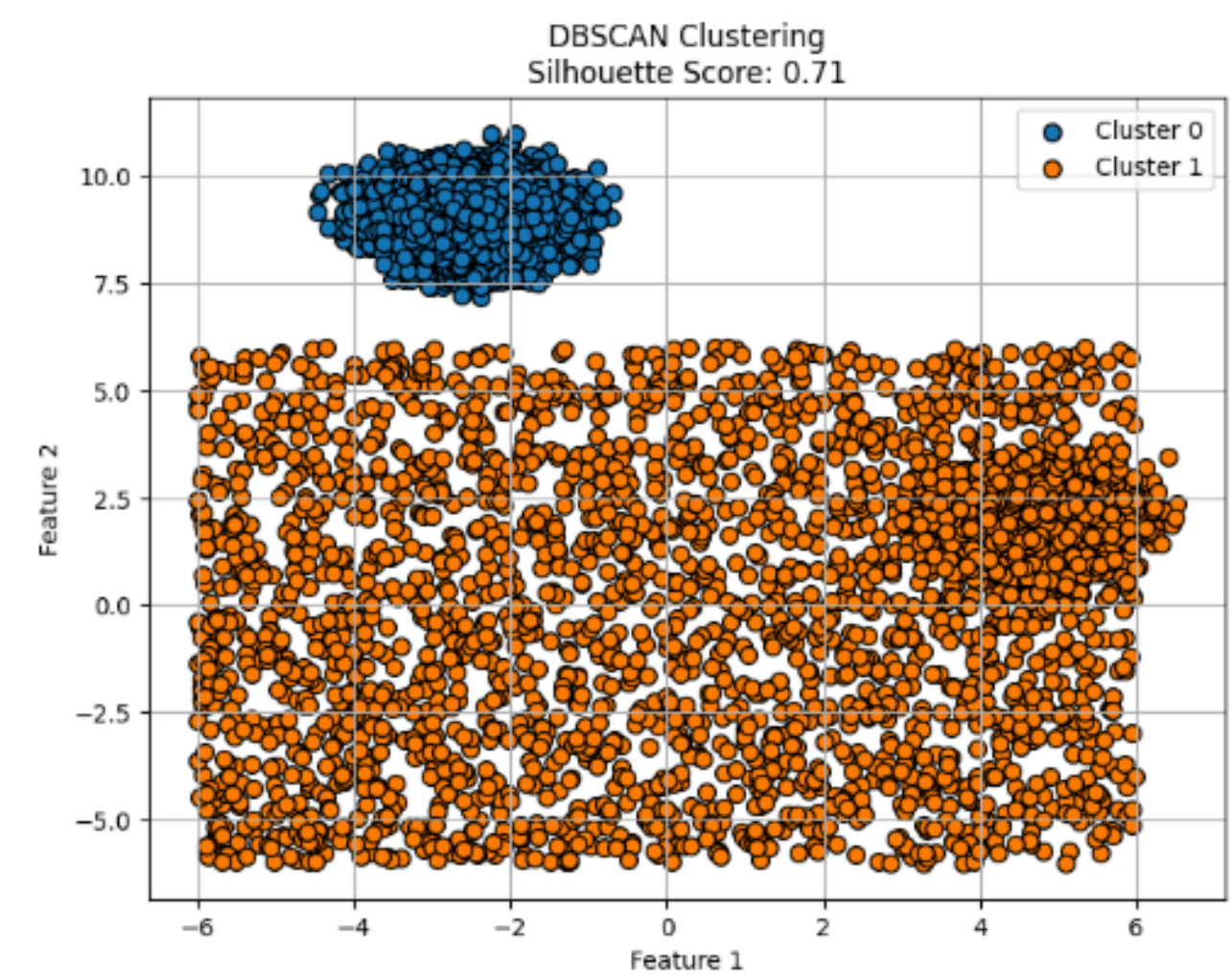


Figure 22: DBSCAN score

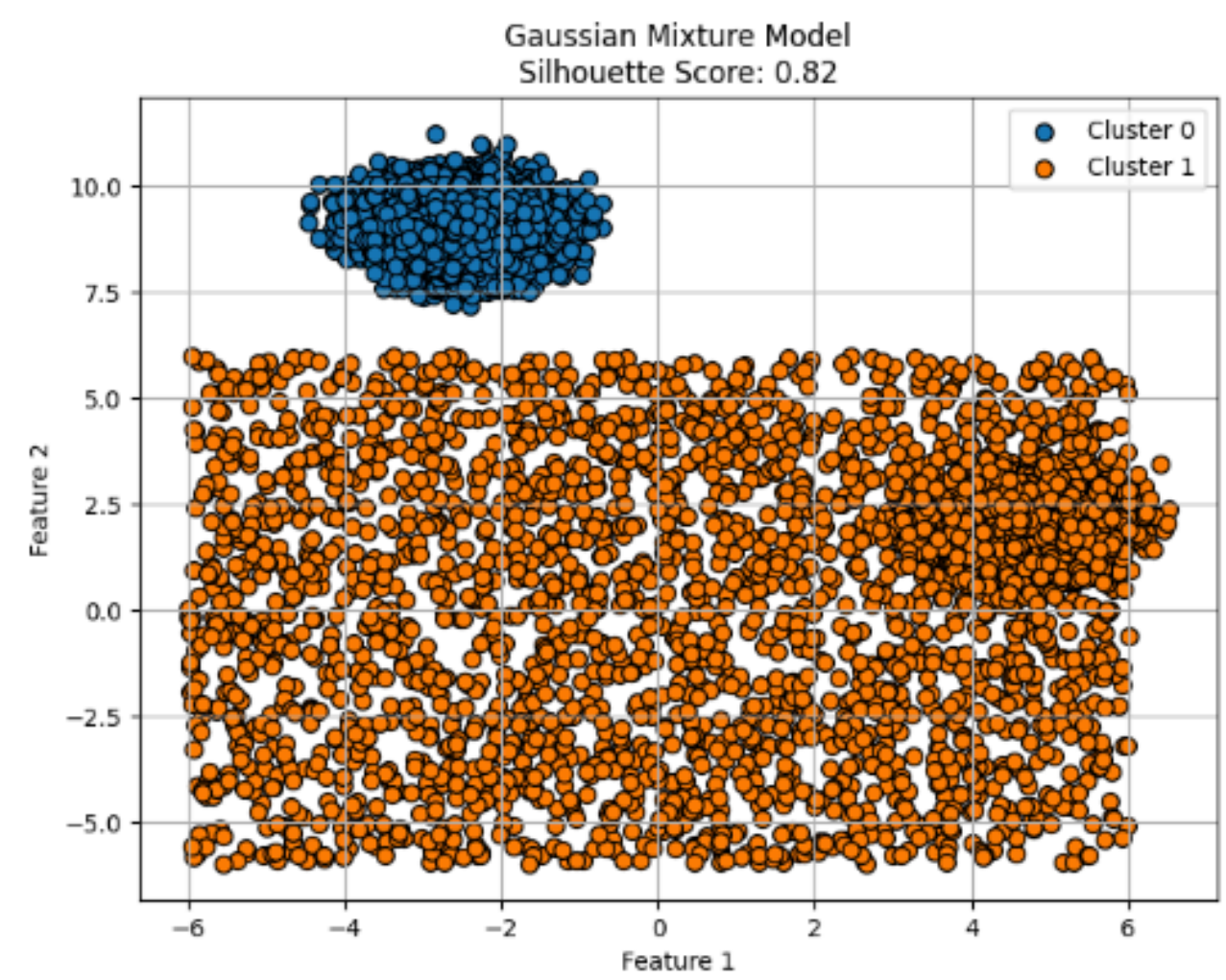


Figure 23: GMM scoer

Figure 24: Scores in Clustering Techniques using sklearn



**Thank You**