

Data

Procedure

Hyperparameters

Training Data**Unlabeled Data**

Significantly more normal than
anomalous samples required

Labeled Data

No requirement regarding ratio
+1 = normal, -1 = anomalous

Pre-Training of Autoencoder

Train Autoencoder \mathcal{W}_E
optimize Autoencoding Objective
for E_A Epochs
with L_A Learning Rate
No Labels Used / Required

Outputs

\mathcal{W} : Encoder / DeepSAD Network
 \mathbf{w}_E : Encoder Network Weights

Pre-Training Hyperparameters**Autoencoder Architecture**

\mathcal{W}_E : Autoencoder Network
 \mathbb{R}^d : Latent Space Size

Hyperparameters

E_A : Number of Epochs
 L_A : Learning Rate AE

Calculate Hypersphere Center

Init Network \mathcal{W} with \mathbf{w}_E
Forward Pass on all data
Hypersphere center \mathbf{c} is mean
of all Latent Representation

Outputs

\mathbf{c} : Hypersphere Center

Main Training

Init Network \mathcal{W} with \mathbf{w}_E
Train Network \mathcal{W}
optimize DeepSAD Objective
for E_M Epochs
with L_M Learning Rate
Considers Labels with η strength

Outputs

\mathcal{W} : DeepSAD Network
 \mathbf{w} : DeepSAD Network Weights
 \mathbf{c} : Hypersphere Center

Main-Training Hyperparameters

E_M : Number of Epochs
 L_M : Learning Rate
 η : Weight Labeled/Unlabeled

Inference**Unseen Data****New Data Sample**

Same data type as training data

Init Network \mathcal{W} with \mathbf{w}
Forward Pass on sample = \mathbf{p}
Calculate Distance $\mathbf{p} \rightarrow \mathbf{c}$
Distance = Anomaly Score

Outputs

Anomaly Score (Analog Value)
Higher for Anomalies