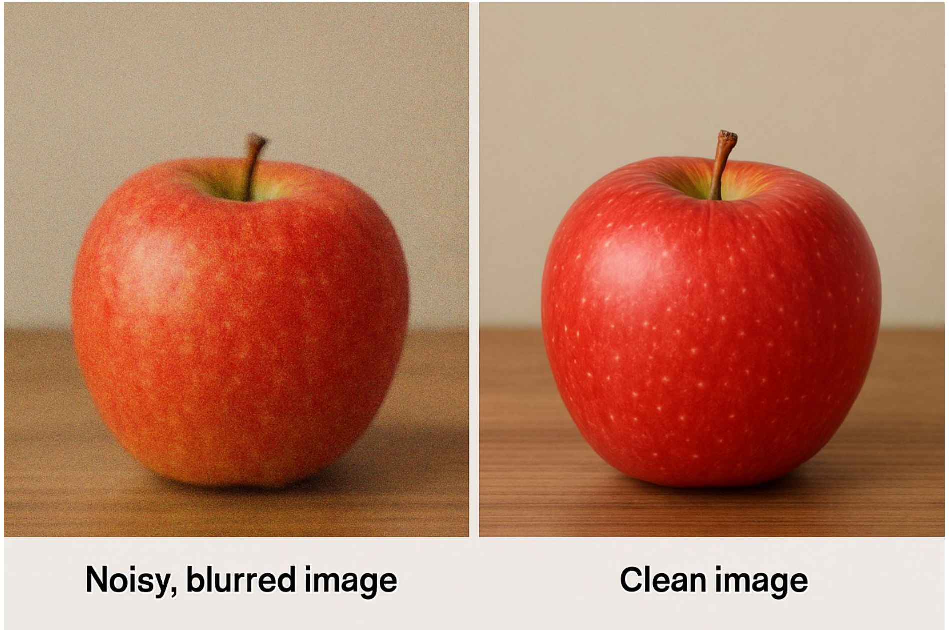
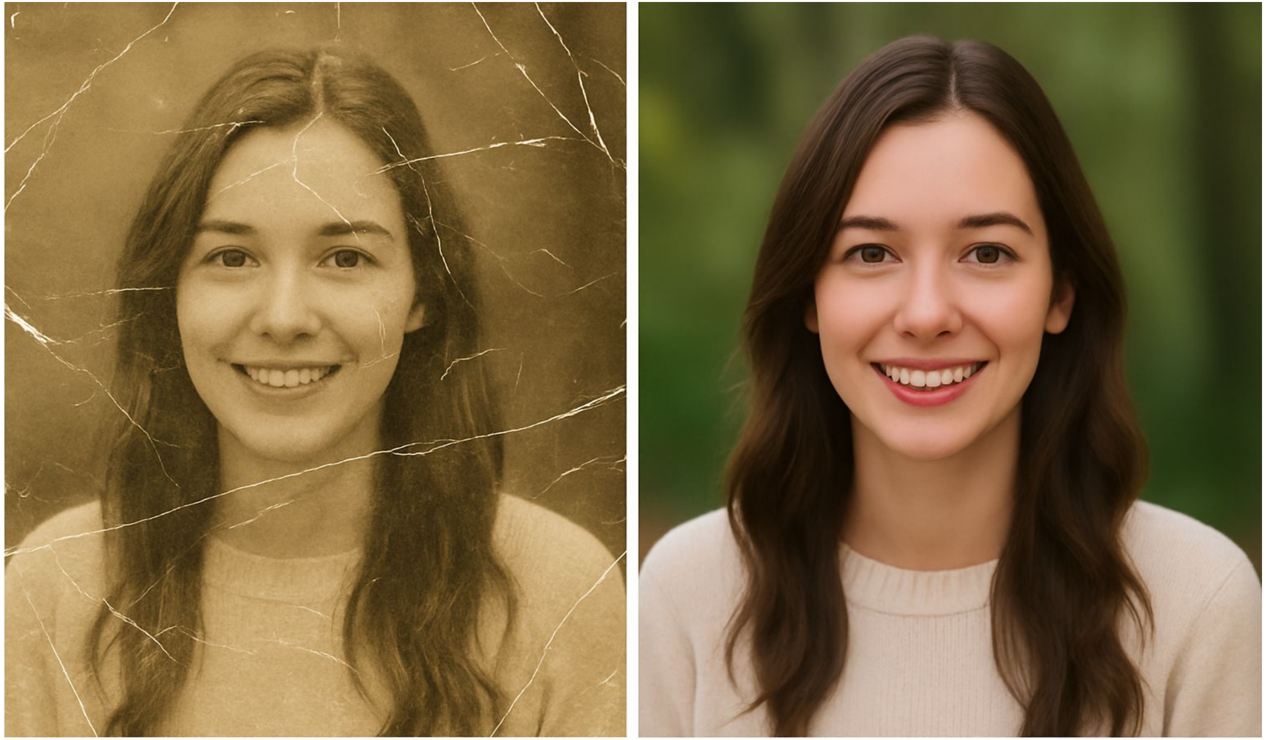
Denoising Autoencoders (DAE)



Core Idea of a DAE

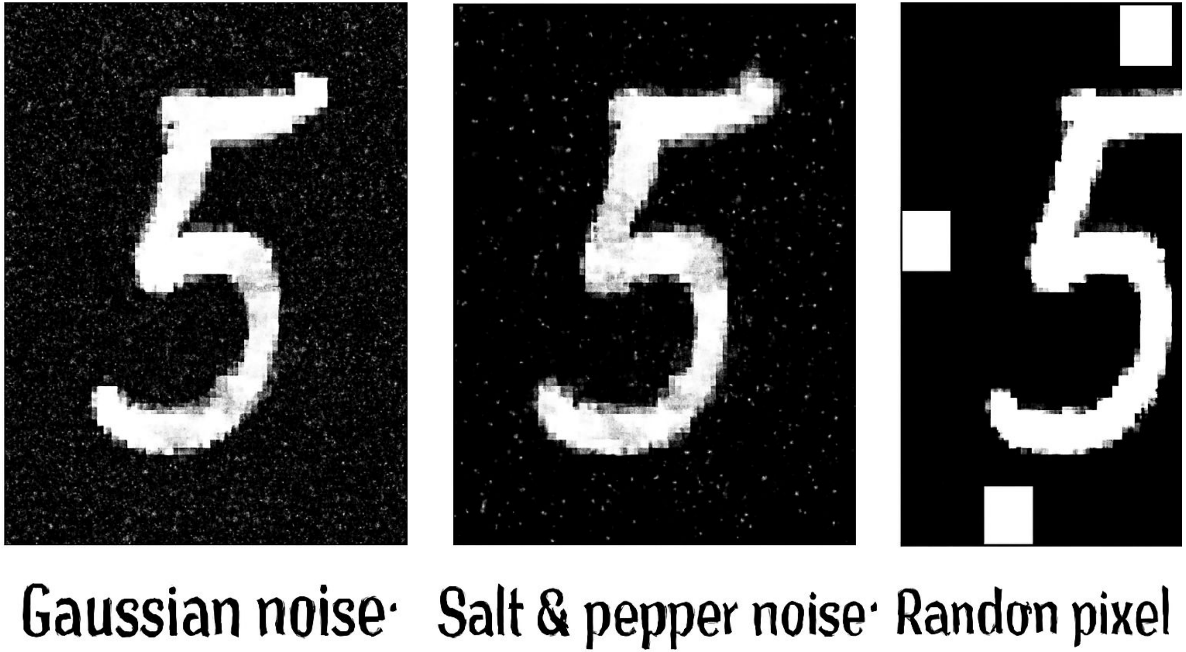
Original image → Noisy version → Reconstructed original image

Analogy: DAE as a Photo Restorer



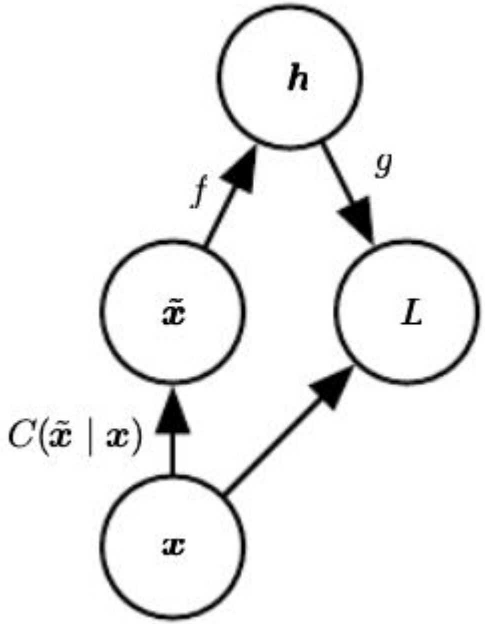
Old, scratched photograph | Digitally restored

How Do We Introduce Corruption?



Training a DAE – Step by Step

1. Clean image x
2. Corrupted image $\tilde{x}$
3. Latent code $h = f(\tilde{x})$
4. Reconstruction $\hat{x} = g(h)$



Applications of DAE

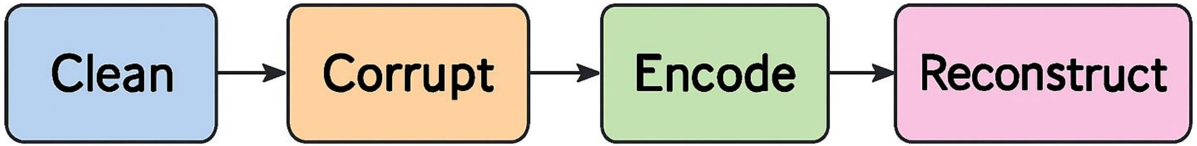
Image deblurring

Audio denoising

Anomaly detection

Pretraining for deep learning models

DAE in a Nutshell



Quiz Time!

Q1. What is the main difference between a standard autoencoder and a denoising autoencoder?

A. DAEs reconstruct the input exactly as it is.

B. DAEs add noise to the output to make it robust.

C. DAEs are trained on corrupted inputs but reconstruct clean outputs.

D. DAEs only work on image data.

Quiz Time!

Q2. In Denoising Autoencoders, what does the corruption process $C(\tilde{x}|x)$ represent?

A. A function that compresses the input data.

B. A distribution over possible denoised outputs.

C. A mechanism to generate noisy versions of the input.

D. A loss function used to measure reconstruction error.

Quiz Time!

Q3. Which of the following is a valid example of a corruption technique used in DAEs?

A. Max pooling

B. Softmax activation

C. Salt and pepper noise

D. Feature scaling

Quiz Time!

Q4. What benefit does a Denoising Autoencoder offer beyond just cleaning noisy data?

A. It requires fewer training samples.

B. It always achieves higher pixel accuracy.

C. It learns robust and meaningful latent representations.

D. It eliminates the need for a decoder.