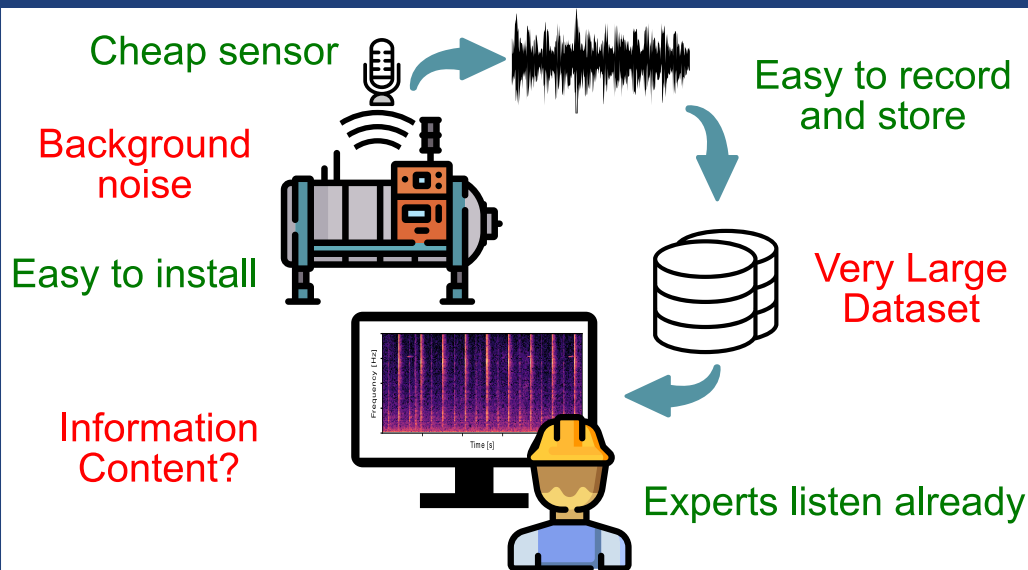


"Listening" to machine: a new trend



End-to-end Learning for Monitoring

Traditional features:
(Fourier Spectrum, Multiscale entropy, Energy,...)

Not generalisable
Sensitive to noise
Hard to engineer (time + knowledge)

Current State-of-the-Art Machine Learning:

Feature monitoring
Spectrogram based monitoring (eg Spectrogram AE)

Proposition:

End-to-end monitoring
Use Convolution NN as spectral learner

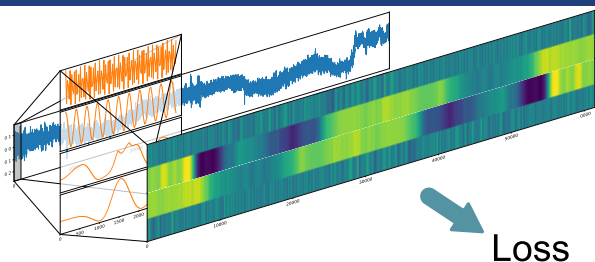
Sparse Wavelet Auto-Encoder

Traditional CNN

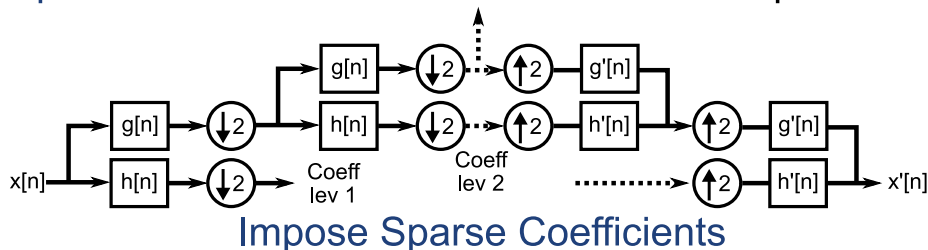
Convolution

⇔ Filtering

⇔ Spectral Analysis



Proposition: Mimic Cascade Wavelet Decomposition



Applications & Results

Anomaly Detection

1. Train Sparse AE in healthy OC
2. Threshold Sparsity Term

Health Monitoring

1. Train Sparse AE in early life
2. Monitor Sparsity over time

Application to Hitachi's MIMII dataset

Slider	SNR					
	6 dB		0 dB		-6 dB	
	BL	Ours	BL	Ours	BL	Ours
0	0.99	0.998	0.99	0.998	0.93	0.998
2	0.93	0.994	0.79	0.996	0.74	0.998
4	0.88	0.975	0.78	0.975	0.61	0.903
6	0.71	0.736	0.56	0.699	0.52	0.595

AUC

l_1 Sparsity against time

