Length Tracking & Undistorted Spectral Representation Generation (LSG)
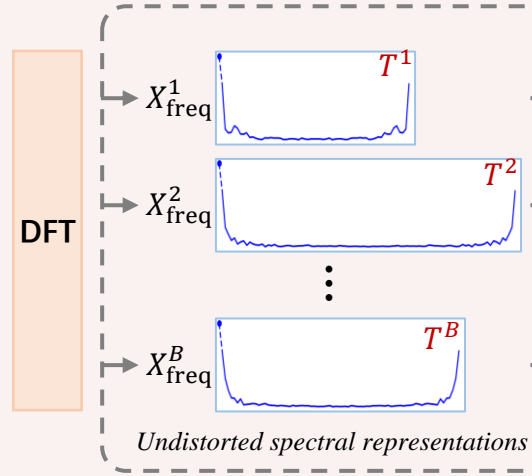
Adaptive Length Normalization (ALN)

Truncating
T Retaining

T_{pad}

X^1_{pad}

X^2_{pad}

X^B_{pad}

$\mathbf{T} = (T^1, T^2, \dots, T^B)$

Input

SP Input

SP Layer

SP Output

Output

DFT

X^1_{freq} T^1

X^2_{freq} T^2

X^B_{freq} T^B

Undistorted spectral representations

T^1

T^2

T^B

$k = 0, 1, \dots, T^b-1$ *frequency*

Frequency Domain

$\hat{X}^1_{\text{freq}}$ T

$\hat{X}^2_{\text{freq}}$ T

$\hat{X}^B_{\text{freq}}$ T

$k = 0, 1, \dots, T-1$

IDFT

X^1_{t} T

X^2_{t} T

X^B_{t} T
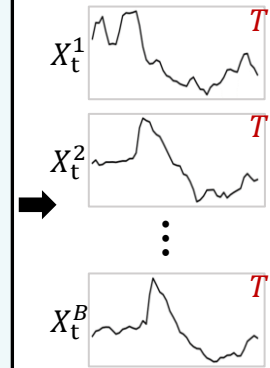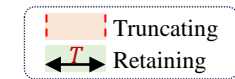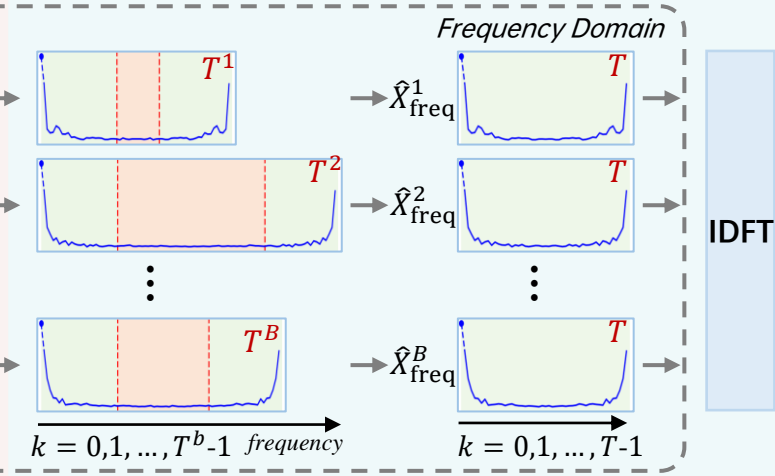
Model
SP Layer can be inserted into model as plugin layer

Input:
A batch of padded time series $\boldsymbol{X}_{\text{pad}}$ and original lengths vector $\mathbf{T}$.

Step1:
Utilizing T^b to exclude the padded data points in X^b_{pad} and generating undistorted spectral representation X^b_{freq}.

Step2:
Adaptively truncating high frequencies in X^b_{freq} and converting back to time domain.

SP Output:
Equal-length time-domain representations X_{t}.