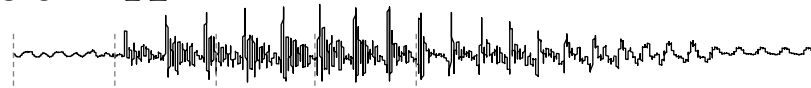


## Time domain

Waveform  $\mathbf{X}$

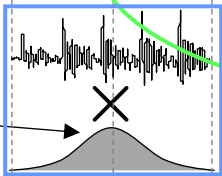
$\mathbf{x}^{(1)}$



...

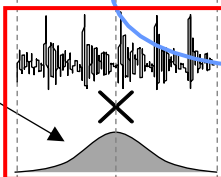
Discrete Fourier transform

$\mathbf{x}^{(2)}$



Discrete Fourier transform

$\mathbf{x}^{(3)}$

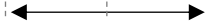


Discrete Fourier transform

Shift length  $\mathcal{T}$

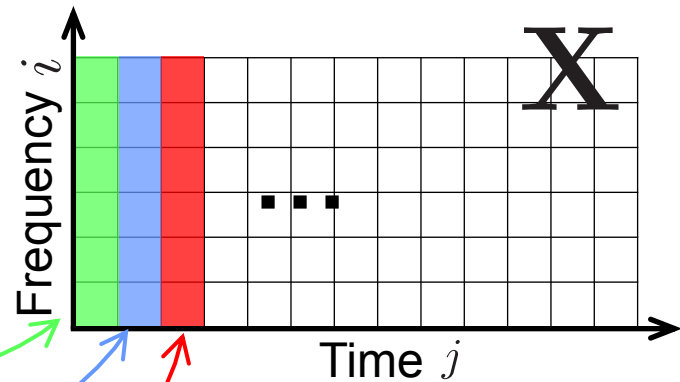


Short-time length  $Q$



Window function  $\omega$

## Time-frequency domain



**Spectrogram**

(complex-valued matrix)