

APS-USCT: Ultrasound Computed Tomography on Sparse Data via AI-Physic Synergy

Supplementary Material

1 Neural Network Architectures in APS-USCT

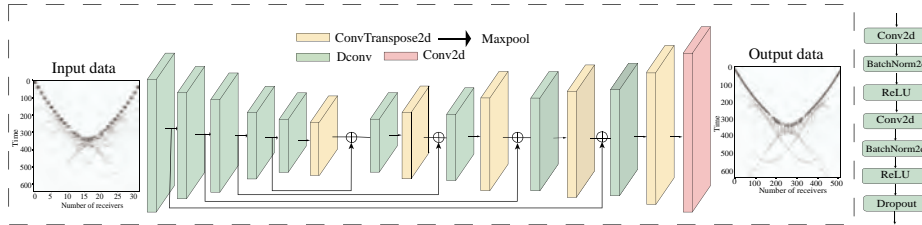


Fig. 1: The detailed encoder-decoder neural network architecture used in APS-wave: (left) the 15-layer structure to process input sparse data and generate output dense data, which include ConvTranspose2d operator, Conv2d operator and Dconv block; (right) the details of Dconv block which further include 2 Conv2d operators and others. The detailed hyperparameters of these operators are given in left-hand of Table 1 in this Supplementary.

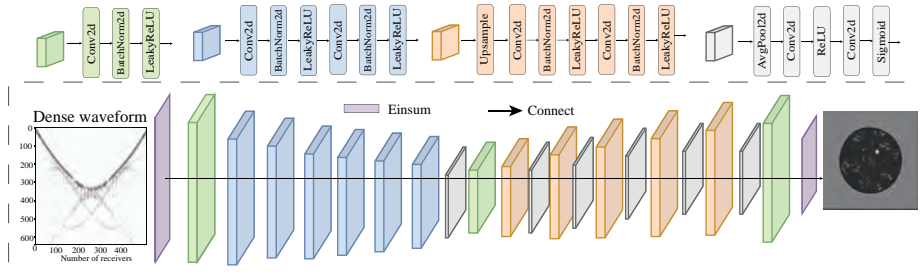


Fig. 2: The detailed InversionNet architecture with Squeeze-and-Excitation (SE) Blocks in APS-FWI: (upper) the illustrations of different types of neural blocks used in APS-FWI; (bottom) the InversionNet with optional SE-blocks which take the waveform data as input and reconstruct the output speed of sound (SOS) maps. It includes the optional SE blocks (gray), encoder blocks (blue), decoder blocks (orange), and convolutional blocks with leakyReLU (green).

No Author Given

Table 1: Detailed hyperparameters of each layer for APS-wave and APS-FWI: (left) The 15-layer APS-wave, in which the parameter of one DConv is applied to its two Conv2d operators. (right) the InversionNet with SE-block in APS-FWI.

APS-wave				APS-FWI			
layer_name	kernel	stride	padding	layer_name	kernel	stride	padding
Dconv	3	1	1	Convblock1	5	2	2
Dconv	3	1	1	Convblock2	5	2	2
Dconv	3	1	1	Convblock3	5	2	2
Dconv	3	1	1	Convblock4	3	1	1
Dconv	3	1	1	Convblock5	3	1	1
ConvTranspose2d	3	2	1	Convblock6	3	1	1
Dconv	3	1	1	Convblock7	3	1	1
ConvTranspose2d	3	2	1	Se_decoder0	1	0	0
Dconv	3	1	1	Convblock8	4	0	0
ConvTranspose2d	3	2	1	Deconv1	3	1	1
Dconv	3	1	1	Se_decoder1	1	0	0
ConvTranspose2d	3	2	1	Deconv2	3	1	1
Dconv	3	1	1	Se_decoder2	1	0	0
ConvTranspose2d	3	2	1	Deconv3	3	1	1
Conv2d	1	1	0	Se_decoder3	1	0	0
				Deconv4	3	1	1
				Se_decoder4	1	0	0
				Deconv5	3	1	1
				Se_decoder5	1	0	0
				Deconv6	3	1	1

2 Experimental Configurations

Table 2: Experiment configurations: training parameters in APS-USTC

APS-wave		APS-FWI	
Hyper-parameters	Value	Hyper-parameters	Value
Batch Size	32	Batch Size	16
#Epoch	100	#Epoch	2000
Optimizer	AdamW	Optimizer	AdamW
Weight Decay	1e-4	Weight Decay	1e-3
Learning Rate	1e-4	Learning Rate	1e-4