Model Summary

Layer (Type)	Output Shape	Param #	Connected to
input_layer (InputLayer)	(None, 240, 240, 1)	0	—
conv2d (Conv2D)	(None, 240, 240, 32)	320	input_layer[0][0]
batch_normalization (BatchNormalization)	(None, 240, 240, 32)	128	conv2d[0][0]
activation (ReLU)	(None, 240, 240, 32)	0	batch_normalization[0][0]
global_average_pooling2d (GlobalAveragePooling2D)	(None, 32)	0	activation[0][0]
global_max_pooling2d (GlobalMaxPooling2D)	(None, 32)	0	activation[0][0]
reshape (Reshape)	(None, 1, 1, 32)	0	global_average_pooling2d[0][0]
reshape_1 (Reshape)	(None, 1, 1, 32)	0	global_max_pooling2d[0][0]
dense (Dense)	(None, 1, 1, 4)	132	reshape[0][0], reshape_1[0][0]
dense_1 (Dense)	(None, 1, 1, 32)	160	dense[0][0], dense_1[0][0]
add (Add)	(None, 1, 1, 32)	0	dense_1[0][0], dense_1[1][0]
activation_1 (Sigmoid)	(None, 1, 1, 32)	0	add[0][0]
multiply (Multiply)	(None,	0	activation[0][0],

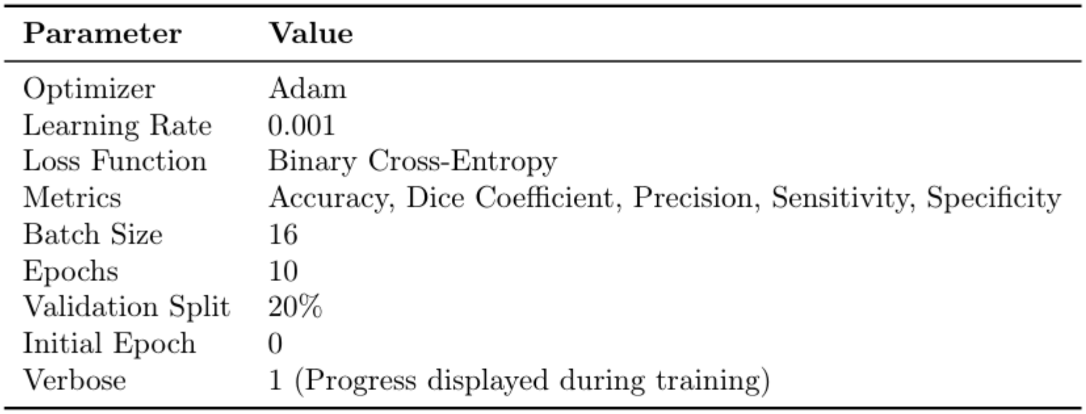
	240, 240, 32)		activation_1[0][0]
lambda (Mean)	(None, 240, 240, 1)	0	multiply[0][0]
lambda_1 (Max)	(None, 240, 240, 1)	0	multiply[0][0]
concatenate_1 (Concatenate)	(None, 240, 240, 2)	0	lambda[0][0], lambda_1[0][0]
conv2d_1 (Conv2D)	(None, 240, 240, 1)	98	concatenate_1[0][0]
multiply_1 (Multiply)	(None, 240, 240, 32)	0	multiply[0][0], conv2d_1[0][0]
max_pooling2d (MaxPooling2D)	(None, 120, 120, 32)	0	multiply_1[0][0]
conv2d_2 (Conv2D)	(None, 120, 120, 64)	18,496	max_pooling2d[0][0]
batch_normalization_1 (BatchNormalization)	(None, 120, 120, 64)	256	conv2d_2[0][0]
activation_2 (ReLU)	(None, 120, 120, 64)	0	batch_normalization_1[0][0]
global_average_pooling2d_1 (GlobalAveragePooling2D)	(None, 64)	0	activation_2[0][0]
global_max_pooling2d_1 (GlobalMaxPooling2D)	(None, 64)	0	activation_2[0][0]
reshape_2 (Reshape)	(None, 1,	0	global_average_pooling2d_1[0][0]

	1, 64)		
reshape_3 (Reshape)	(None, 1, 1, 64)	0	global_max_pooling2d_1[0][0]
dense_2 (Dense)	(None, 1, 1, 8)	520	reshape_2[0][0], reshape_3[0][0]
dense_3 (Dense)	(None, 1, 1, 64)	576	dense_2[0][0], dense_2[1][0]
add_1 (Add)	(None, 1, 1, 64)	0	dense_3[0][0], dense_3[1][0]
activation_3 (Sigmoid)	(None, 1, 1, 64)	0	add_1[0][0]
multiply_2 (Multiply)	(None, 120, 120, 64)	0	activation_2[0][0], activation_3[0][0]
lambda_2 (Mean)	(None, 120, 120, 1)	0	multiply_2[0][0]
lambda_3 (Max)	(None, 120, 120, 1)	0	multiply_2[0][0]
concatenate_2 (Concatenate)	(None, 120, 120, 2)	0	lambda_2[0][0], lambda_3[0][0]
conv2d_3 (Conv2D)	(None, 120, 120, 1)	98	concatenate_2[0][0]
multiply_3 (Multiply)	(None, 120, 120, 64)	0	multiply_2[0][0], conv2d_3[0][0]
max_pooling2d_1 (MaxPooling2D)	(None, 60, 60, 64)	0	multiply_3[0][0]
conv2d_4 (Conv2D)	(None, 60, 60,	73,856	max_pooling2d_1[0][0]

	128)		
batch_normalization_2 (BatchNormalization)	(None, 60, 60, 128)	512	conv2d_4[0][0]
activation_4 (ReLU)	(None, 60, 60, 128)	0	batch_normalization_2[0][0]

Total params:	12,338,155
Trainable params:	12,335,211
Non-trainable params:	2,944

Table 2: Training Configurations of Proposed CCBAMT Framework



Parameter	Value
Optimizer	Adam
Learning Rate	0.001
Loss Function	Binary Cross-Entropy
Metrics	Accuracy, Dice Coefficient, Precision, Sensitivity, Specificity
Batch Size	16
Epochs	10
Validation Split	20%
Initial Epoch	0
Verbose	1 (Progress displayed during training)

Table 3: CNN Parameter Specifications

Parameter	**Value**	**Description**
Convolution Kernel Size	3×3	Size of convolutional filters
Initial Filters	32	Filters in first convolutional layer
Filter Progression	32→64→128→256→512 →256→128→64→32	Filter counts across encoder-decoder path
Activation Function	ReLU	Activation used after convolutions
Pooling Type	Max Pooling	Downsampling strategy
Pooling Size	2×2	Pooling window size
Upsampling	2×2	Upsampling factor
Final Activation	Sigmoid	Activation at output layer

Table 4: Transformer Parameter Specifications

Parameter	**Value**	**Description**
Number of Heads	8	Heads in multi-head attention
Feed Forward Dimension	512	Dimension of feed-forward network
Dropout Rate	0.1	Dropout probability
Layer Norm Epsilon	1×10^{-6}	Stability constant
Input Format	Reshaped CNN features	How CNN features enter transformer

Table 5: CBAM Parameter Specifications

Parameter	**Value**	**Description**
Channel Attention Ratio	8	Reduction ratio for channel attention
Shared Dense Activation	ReLU	Activation in channel attention MLP
Kernel Initializer	he_normal	Weight initialization method
Spatial Attention Kernel Size	7×7	Kernel size for spatial attention
Attention Activation	Sigmoid	Activation used for attention maps
Pooling Operations	Global Avg + Max	Pooling methods for attention