ResNet-EncoderDecoder

Encoder

Layer (type)	Output Shape	Param #	Connected to
input_1 (InputLayer)	(None, 224, 224, 3)	0	
conv1_pad (ZeroPadding2D)	(None, 230, 230, 3)	0	input_1[0][0]
conv1 (Conv2D)	(None, 112, 112, 64)	9472	conv1_pad[0][0]
bn_conv1 (BatchNormalization)	(None, 112, 112, 64)	256	conv1[0][0]
activation_1 (Activation)	(None, 112, 112, 64)	0	bn_conv1[0][0]
pool1_pad (ZeroPadding2D)	(None, 114, 114, 64)	0	activation_1[0][0]
max_pooling2d_1 (MaxPooling2D)	(None, 56, 56, 64)	0	pool1_pad[0][0]
⟆			
res2c_branch2b (Conv2D)	(None, 56, 56, 64)	36928	activation_8[0][0]
bn2c_branch2b (BatchNormalizati	(None, 56, 56, 64)	256	res2c_branch2b[0][0]
activation_9 (Activation)	(None, 56, 56, 64)	0	bn2c_branch2b[0][0]
res2c_branch2c (Conv2D)	(None, 56, 56, 256)	16640	activation_9[0][0]
bn2c_branch2c (BatchNormalizati	(None, 56, 56, 256)	1024	res2c_branch2c[0][0]
add_3 (Add)	(None, 56, 56, 256)	0	bn2c_branch2c[0][0] activation_7[0][0]
activation_10 (Activation)	(None, 56, 56, 256)	0	add_3[0][0]
res3a_branch2a (Conv2D)	(None, 28, 28, 128)	32896	activation_10[0][0]
⟆			
res3d_branch2b (Conv2D)	(None, 28, 28, 128)	147584	activation_20[0][0]
bn3d_branch2b (BatchNormalizati	(None, 28, 28, 128)	512	res3d_branch2b[0][0]
activation_21 (Activation)	(None, 28, 28, 128)	0	bn3d_branch2b[0][0]
res3d_branch2c (Conv2D)	(None, 28, 28, 512)	66048	activation_21[0][0]
bn3d_branch2c (BatchNormalizati	(None, 28, 28, 512)	2048	res3d_branch2c[0][0]
add_7 (Add)	(None, 28, 28, 512)	0	bn3d_branch2c[0][0] activation_19[0][0]
activation_22 (Activation)	(None, 28, 28, 512)	0	add_7[0][0]
res4a_branch2a (Conv2D)	(None, 14, 14, 256)	131328	activation_22[0][0]
bn4a_branch2a (BatchNormalizati	(None, 14, 14, 256)	1024	res4a_branch2a[0][0]
⟆			
activation_38 (Activation)	(None, 14, 14, 256)	0	bn4f_branch2a[0][0]
res4f_branch2b (Conv2D)	(None, 14, 14, 256)	590080	activation_38[0][0]
bn4f_branch2b (BatchNormalizati	(None, 14, 14, 256)	1024	res4f_branch2b[0][0]
activation_39 (Activation)	(None, 14, 14, 256)	0	bn4f_branch2b[0][0]
res4f_branch2c (Conv2D)	(None, 14, 14, 1024)	263168	activation_39[0][0]
bn4f_branch2c (BatchNormalizati	(None, 14, 14, 1024)	4096	res4f_branch2c[0][0]
add_13 (Add)	(None, 14, 14, 1024)	0	bn4f_branch2c[0][0] activation_37[0][0]
activation_40 (Activation)	(None, 14, 14, 1024)	0	add_13[0][0]
res5a_branch2a (Conv2D)	(None, 7, 7, 512)	524800	activation_40[0][0]
⟆			
res5c_branch2b (Conv2D)	(None, 7, 7, 512)	2359808	activation_47[0][0]
bn5c_branch2b (BatchNormalizati	(None, 7, 7, 512)	2048	res5c_branch2b[0][0]
activation_48 (Activation)	(None, 7, 7, 512)	0	bn5c_branch2b[0][0]
res5c_branch2c (Conv2D)	(None, 7, 7, 2048)	1050624	activation_48[0][0]

①Skip Connection⇒

②Skip Connection⇒

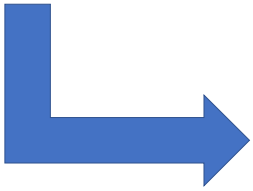
③Skip Connection⇒

④Skip Connection⇒

⑤Skip Connection⇒

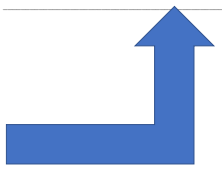
Decoder

activation_50 (Activation)	(None, 224, 224, 1)	0	prediction[0][0]
prediction (Conv2D)	(None, 224, 224, 1)	33	decoder_output_activation[0][0]
decoder_output_activation (PReL	(None, 224, 224, 32)	1605632	decoder_output_bn[0][0]
decoder_output_bn (BatchNormali	(None, 224, 224, 32)	128	decoder_output_conv[0][0]
decoder_output_conv (Conv2D)	(None, 224, 224, 32)	36896	up_sampling2d_5[0][0]
up_sampling2d_5 (UpSampling2D)	(None, 224, 224, 128	0	concatenate_5[0][0]
concatenate_5 (Concatenate)	(None, 112, 112, 128	0	conv1[0][0] up_sampling2d_4[0][0]
up_sampling2d_4 (UpSampling2D)	(None, 112, 112, 64)	0	decoder1_activation[0][0]
decoder1_activation (PReLU)	(None, 56, 56, 64)	200704	decoder1_bn[0][0]
decoder1_bn (BatchNormalization	(None, 56, 56, 64)	256	decoder1_conv[0][0]
decoder1_conv (Conv2D)	(None, 56, 56, 64)	184384	concatenate_4[0][0]
concatenate_4 (Concatenate)	(None, 56, 56, 320)	0	res2c_branch2c[0][0] up_sampling2d_3[0][0]
up_sampling2d_3 (UpSampling2D)	(None, 56, 56, 64)	0	decoder2_activation[0][0]
decoder2_activation (PReLU)	(None, 28, 28, 64)	50176	decoder2_bn[0][0]
decoder2_bn (BatchNormalization	(None, 28, 28, 64)	256	decoder2_conv[0][0]
decoder2_conv (Conv2D)	(None, 28, 28, 64)	368704	concatenate_3[0][0]
concatenate_3 (Concatenate)	(None, 28, 28, 640)	0	res3d_branch2c[0][0] up_sampling2d_2[0][0]
up_sampling2d_2 (UpSampling2D)	(None, 28, 28, 128)	0	decoder3_activation[0][0]
decoder3_activation (PReLU)	(None, 14, 14, 128)	25088	decoder3_bn[0][0]
decoder3_bn (BatchNormalization	(None, 14, 14, 128)	512	decoder3_conv[0][0]
decoder3_conv (Conv2D)	(None, 14, 14, 128)	1474688	concatenate_2[0][0]
concatenate_2 (Concatenate)	(None, 14, 14, 1280)	0	res4f_branch2c[0][0] up_sampling2d_1[0][0]
up_sampling2d_1 (UpSampling2D)	(None, 14, 14, 256)	0	decoder4_activation[0][0]
decoder4_activation (PReLU)	(None, 7, 7, 256)	12544	decoder4_bn[0][0]
decoder4_bn (BatchNormalization	(None, 7, 7, 256)	1024	decoder4_conv[0][0]
decoder4_conv (Conv2D)	(None, 7, 7, 256)	5898496	concatenate_1[0][0]
concatenate_1 (Concatenate)	(None, 7, 7, 2560)	0	res5c_branch2c[0][0] center_activation[0][0]



Center層

center_activation (PReLU)	(None, 7, 7, 512)	25088	center_bn[0][0]
center_bn (BatchNormalization)	(None, 7, 7, 512)	2048	center_conv[0][0]
center_conv (Conv2D)	(None, 7, 7, 512)	9437696	res5c_branch2c[0][0]



Encoder部の比較

Encoder(ResNet)

Layer (type)	Output Shape	Param #	Connected to
input_1 (InputLayer)	(None, 224, 224, 3)	0	
conv1_pad (ZeroPadding2D)	(None, 230, 230, 3)	0	input_1[0][0]
conv1 (Conv2D)	(None, 112, 112, 64)	9472	conv1_pad[0][0]
bn_conv1 (BatchNormalization)	(None, 112, 112, 64)	256	conv1[0][0]
activation_1 (Activation)	(None, 112, 112, 64)	0	bn_conv1[0][0]
pool1_pad (ZeroPadding2D)	(None, 114, 114, 64)	0	activation_1[0][0]
max_pooling2d_1 (MaxPooling2D)	(None, 56, 56, 64)	0	pool1_pad[0][0]
res2a_branch2a (Conv2D)	(None, 56, 56, 64)	4160	max_pooling2d_1[0][0]
bn2a_branch2a (BatchNormalizati	(None, 56, 56, 64)	256	res2a_branch2a[0][0]
activation_2 (Activation)	(None, 56, 56, 64)	0	bn2a_branch2a[0][0]
⋮			
activation_9 (Activation)	(None, 56, 56, 64)	0	bn2c_branch2b[0][0]
res2c_branch2c (Conv2D)	(None, 56, 56, 256)	16640	activation_9[0][0]
bn2c_branch2c (BatchNormalizati	(None, 56, 56, 256)	1024	res2c_branch2c[0][0]
add_3 (Add)	(None, 56, 56, 256)	0	bn2c_branch2c[0][0] activation_7[0][0]
activation_10 (Activation)	(None, 56, 56, 256)	0	add_3[0][0]
res3a_branch2a (Conv2D)	(None, 28, 28, 128)	32896	activation_10[0][0]
bn3a_branch2a (BatchNormalizati	(None, 28, 28, 128)	512	res3a_branch2a[0][0]
activation_11 (Activation)	(None, 28, 28, 128)	0	bn3a_branch2a[0][0]
res3a_branch2b (Conv2D)	(None, 28, 28, 128)	147584	activation_11[0][0]
⋮			
bn3d_branch2b (BatchNormalizati	(None, 28, 28, 128)	512	res3d_branch2b[0][0]
activation_21 (Activation)	(None, 28, 28, 128)	0	bn3d_branch2b[0][0]
res3d_branch2c (Conv2D)	(None, 28, 28, 512)	66048	activation_21[0][0]
bn3d_branch2c (BatchNormalizati	(None, 28, 28, 512)	2048	res3d_branch2c[0][0]
add_7 (Add)	(None, 28, 28, 512)	0	bn3d_branch2c[0][0] activation_19[0][0]
activation_22 (Activation)	(None, 28, 28, 512)	0	add_7[0][0]
res4a_branch2a (Conv2D)	(None, 14, 14, 256)	131328	activation_22[0][0]
bn4a_branch2a (BatchNormalizati	(None, 14, 14, 256)	1024	res4a_branch2a[0][0]
activation_23 (Activation)	(None, 14, 14, 256)	0	bn4a_branch2a[0][0]
res4a_branch2b (Conv2D)	(None, 14, 14, 256)	590080	activation_23[0][0]
bn4a_branch2b (BatchNormalizati	(None, 14, 14, 256)	1024	res4a_branch2b[0][0]
⋮			
activation_39 (Activation)	(None, 14, 14, 256)	0	bn4f_branch2b[0][0]
res4f_branch2c (Conv2D)	(None, 14, 14, 1024)	263168	activation_39[0][0]
bn4f_branch2c (BatchNormalizati	(None, 14, 14, 1024)	4096	res4f_branch2c[0][0]
add_13 (Add)	(None, 14, 14, 1024)	0	bn4f_branch2c[0][0] activation_37[0][0]
activation_40 (Activation)	(None, 14, 14, 1024)	0	add_13[0][0]
res5a_branch2a (Conv2D)	(None, 7, 7, 512)	524800	activation_40[0][0]
⋮			
activation_48 (Activation)	(None, 7, 7, 512)	0	bn5c_branch2b[0][0]
res5c_branch2c (Conv2D)	(None, 7, 7, 2048)	1050624	activation_48[0][0]

Convert

Encoder(VGG19)

Layer (type)	Output Shape	Param #
input_2 (InputLayer)	(None, 224, 224, 3)	0
block1_conv1 (Conv2D)	(None, 224, 224, 64)	1792
block1_conv2 (Conv2D)	(None, 224, 224, 64)	36928
block1_pool (MaxPooling2D)	(None, 112, 112, 64)	0
block2_conv1 (Conv2D)	(None, 112, 112, 128)	73856
block2_conv2 (Conv2D)	(None, 112, 112, 128)	147584
block2_pool (MaxPooling2D)	(None, 56, 56, 128)	0
block3_conv1 (Conv2D)	(None, 56, 56, 256)	295168
block3_conv2 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv3 (Conv2D)	(None, 56, 56, 256)	590080
block3_conv4 (Conv2D)	(None, 56, 56, 256)	590080
block3_pool (MaxPooling2D)	(None, 28, 28, 256)	0
block4_conv1 (Conv2D)	(None, 28, 28, 512)	1180160
block4_conv2 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv3 (Conv2D)	(None, 28, 28, 512)	2359808
block4_conv4 (Conv2D)	(None, 28, 28, 512)	2359808
block4_pool (MaxPooling2D)	(None, 14, 14, 512)	0
block5_conv1 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv2 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv3 (Conv2D)	(None, 14, 14, 512)	2359808
block5_conv4 (Conv2D)	(None, 14, 14, 512)	2359808
block5_pool (MaxPooling2D)	(None, 7, 7, 512)	0