Table S1 Details of the proposed model

Layer (type)	Output shape	Param #	Connected to
data (InputLayer)	(None, 160, 160, 1)	0	
bn_data (BatchNormalization)	(None, 160, 160, 1)	3	data[0][0]
zero_padding2d (ZeroPadding2D)	(None, 166, 166, 1)	0	bn_data[0][0]
conv0 (Conv2D)	(None, 80, 80, 64)	3136	zero_padding2d[0][0]
bn0 (BatchNormalization)	(None, 80, 80, 64)	256	conv0[0][0]
relu0 (Activation)	(None, 80, 80, 64)	0	bn0[0][0]
zero_padding2d_1 (ZeroPadding2D)	(None, 82, 82, 64)	0	relu0[0][0]
pooling0 (MaxPooling2D)	(None, 40, 40, 64)	0	zero_padding2d_1[0][0]
stage1_unit1_bn1 (BatchNormaliz)	(None, 40, 40, 64)	256	pooling0[0][0]
stage1_unit1_relu1 (Activation)	(None, 40, 40, 64)	0	stage1_unit1_bn1[0][0]
zero_padding2d_2 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage1_unit1_relu1[0][0]
stage1_unit1_conv1 (Conv2D)	(None, 40, 40, 64)	36864	zero_padding2d_2[0][0]
stage1_unit1_bn2 (BatchNormaliz)	(None, 40, 40, 64)	256	stage1_unit1_conv1[0][0]
stage1_unit1_relu2 (Activation)	(None, 40, 40, 64)	0	stage1_unit1_bn2[0][0]
zero_padding2d_3 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage1_unit1_relu2[0][0]
stage1_unit1_conv2 (Conv2D)	(None, 40, 40, 64)	36864	zero_padding2d_3[0][0]
stage1_unit1_sc (Conv2D)	(None, 40, 40, 64)	4096	stage1_unit1_relu1[0][0]
add (Add)	(None, 40, 40, 64)	0	stage1_unit1_conv2[0][0] stage1_unit1_sc[0][0]
stage1_unit2_bn1 (BatchNormaliz)	(None, 40, 40, 64)	256	add[0][0]
stage1_unit2_relu1 (Activation)	(None, 40, 40, 64)	0	stage1_unit2_bn1[0][0]
zero_padding2d_4 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage1_unit2_relu1[0][0]
stage1_unit2_conv1 (Conv2D)	(None, 40, 40, 64)	36864	zero_padding2d_4[0][0]
stage1_unit2_bn2 (BatchNormaliz)	(None, 40, 40, 64)	256	stage1_unit2_conv1[0][0]
stage1_unit2_relu2 (Activation)	(None, 40, 40, 64)	0	stage1_unit2_bn2[0][0]
zero_padding2d_5 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage1_unit2_relu2[0][0]
stage1_unit2_conv2 (Conv2D)	(None, 40, 40, 64)	36864	zero_padding2d_5[0][0]
add_1 (Add)	(None, 40, 40, 64)	0	stage1_unit2_conv2[0][0] add[0][0]
stage1_unit3_bn1 (BatchNormaliz)	(None, 40, 40, 64)	256	add_1[0][0]
stage1_unit3_relu1 (Activation)	(None, 40, 40, 64)	0	stage1_unit3_bn1[0][0]
zero_padding2d_6 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage1_unit3_relu1[0][0]
stage1_unit3_conv1 (Conv2D)	(None, 40, 40, 64)	36864	zero_padding2d_6[0][0]
stage1_unit3_bn2 (BatchNormaliz)	(None, 40, 40, 64)	256	stage1_unit3_conv1[0][0]
stage1_unit3_relu2 (Activation)	(None, 40, 40, 64)	0	stage1_unit3_bn2[0][0]
zero_padding2d_7 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage1_unit3_relu2[0][0]
stage1_unit3_conv2 (Conv2D)	(None, 40, 40, 64)	36864	zero_padding2d_7[0][0]
add_2 (Add)	(None, 40, 40, 64)	0	stage1_unit3_conv2[0][0] add_1[0][0]
stage2_unit1_bn1 (BatchNormaliz)	(None, 40, 40, 64)	256	add_2[0][0]
stage2_unit1_relu1 (Activation)	(None, 40, 40, 64)	0	stage2_unit1_bn1[0][0]
zero_padding2d_8 (ZeroPadding2D)	(None, 42, 42, 64)	0	stage2_unit1_relu1[0][0]
stage2_unit1_conv1 (Conv2D)	(None, 20, 20, 128)	73728	zero_padding2d_8[0][0]
stage2_unit1_bn2 (BatchNormaliz)	(None, 20, 20, 128)	512	stage2_unit1_conv1[0][0]
stage2_unit1_relu2 (Activation)	(None, 20, 20, 128)	0	stage2_unit1_bn2[0][0]
zero_padding2d_9 (ZeroPadding2D)	(None, 22, 22, 128)	0	stage2_unit1_relu2[0][0]
stage2_unit1_conv2 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_9[0][0]
stage2_unit1_sc (Conv2D)	(None, 20, 20, 128)	8192	stage2_unit1_relu1[0][0]
add_3 (Add)	(None, 20, 20, 128)	0	stage2_unit1_conv2[0][0] stage2_unit1_sc[0][0]
stage2_unit2_bn1 (BatchNormaliz)	(None, 20, 20, 128)	512	add_3[0][0]
stage2_unit2_relu1 (Activation)	(None, 20, 20, 128)	0	tage2_unit2_bn1[0][0]
zero_padding2d_10 (ZeroPadding2)	(None, 22, 22, 128)	0	stage2_unit2_relu1[0][0]
stage2_unit2_conv1 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_10[0][0]
stage2_unit2_bn2 (BatchNormaliz)	(None, 20, 20, 128)	512	stage2_unit2_conv1[0][0]
stage2_unit2_relu2 (Activation)	(None, 20, 20, 128)	0	stage2_unit2_bn2[0][0]
zero_padding2d_11 (ZeroPadding2)	(None, 22, 22, 128)	0	stage2_unit2_relu2[0][0]
stage2_unit2_conv2 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_11[0][0]
add_4 (Add)	(None, 20, 20, 128)	0	stage2_unit2_conv2[0][0] add_3[0][0]
stage2_unit3_bn1 (BatchNormaliz)	(None, 20, 20, 128)	512	add_4[0][0]
stage2_unit3_relu1 (Activation)	(None, 20, 20, 128)	0	stage2_unit3_bn1[0][0]
zero_padding2d_12 (ZeroPadding2)	(None, 22, 22, 128)	0	stage2_unit3_relu1[0][0]
stage2_unit3_conv1 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_12[0][0]
stage2_unit3_bn2 (BatchNormaliz)	(None, 20, 20, 128)	512	stage2_unit3_conv1[0][0]
stage2_unit3_relu2 (Activation)	(None, 20, 20, 128)	0	stage2_unit3_bn2[0][0]
zero_padding2d_13 (ZeroPadding2)	(None, 22, 22, 128)	0	stage2_unit3_relu2[0][0]
stage2_unit3_conv2 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_13[0][0]
add_5 (Add)	(None, 20, 20, 128)	0	stage2_unit3_conv2[0][0] add_4[0][0]
stage2_unit4_bn1 (BatchNormaliz)	(None, 20, 20, 128)	512	add_5[0][0]
stage2_unit4_relu1 (Activation)	(None, 20, 20, 128)	0	stage2_unit4_bn1[0][0]
zero_padding2d_14 (ZeroPadding2)	(None, 22, 22, 128)	0	stage2_unit4_relu1[0][0]
stage2_unit4_conv1 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_14[0][0]
stage2_unit4_bn2 (BatchNormaliz)	(None, 20, 20, 128)	512	stage2_unit4_conv1[0][0]
stage2_unit4_relu2 (Activation)	(None, 20, 20, 128)	0	stage2_unit4_bn2[0][0]
zero_padding2d_15 (ZeroPadding2)	(None, 22, 22, 128)	0	stage2_unit4_relu2[0][0]
stage2_unit4_conv2 (Conv2D)	(None, 20, 20, 128)	147456	zero_padding2d_15[0][0]
add_6 (Add)	(None, 20, 20, 128)	0	stage2_unit4_conv2[0][0] add_5[0][0]
stage3_unit1_bn1 (BatchNormaliz)	(None, 20, 20, 128)	512	add_6[0][0]
stage3_unit1_relu1 (Activation)	(None, 20, 20, 128)	0	stage3_unit1_bn1[0][0]
zero_padding2d_16 (ZeroPadding2)	(None, 22, 22, 128)	0	stage3_unit1_relu1[0][0]
stage3_unit1_conv1 (Conv2D)	(None, 10, 10, 256)	294912	zero_padding2d_16[0][0]
stage3_unit1_bn2 (BatchNormaliz)	(None, 10, 10, 256)	1024	stage3_unit1_conv1[0][0]
stage3_unit1_relu2 (Activation)	(None, 10, 10, 256)	0	stage3_unit1_bn2[0][0]
zero_padding2d_17 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit1_relu2[0][0]
stage3_unit1_conv2 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_17[0][0]
stage3_unit1_sc (Conv2D)	(None, 10, 10, 256)	32768	stage3_unit1_relu1[0][0]
add_7 (Add)	(None, 10, 10, 256)	0	stage3_unit1_conv2[0][0] stage3_unit1_sc[0][0]
stage3_unit2_bn1 (BatchNormaliz)	(None, 10, 10, 256)	1024	add_7[0][0]
stage3_unit2_relu1 (Activation)	(None, 10, 10, 256)	0	stage3_unit2_bn1[0][0]
zero_padding2d_18 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit2_relu1[0][0]
stage3_unit2_conv1 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_18[0][0]
stage3_unit2_bn2 (BatchNormaliz)	(None, 10, 10, 256)	1024	stage3_unit2_conv1[0][0]
stage3_unit2_relu2 (Activation)	(None, 10, 10, 256)	0	stage3_unit2_bn2[0][0]
zero_padding2d_19 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit2_relu2[0][0]
stage3_unit2_conv2 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_19[0][0]
add_8 (Add)	(None, 10, 10, 256)	0	stage3_unit2_conv2[0][0] add_7[0][0]
stage3_unit3_bn1 (BatchNormaliz)	(None, 10, 10, 256)	1024	add_8[0][0]
stage3_unit3_relu1 (Activation)	(None, 10, 10, 256)	0	stage3_unit3_bn1[0][0]
zero_padding2d_20 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit3_relu1[0][0]
stage3_unit3_conv1 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_20[0][0]
stage3_unit3_bn2 (BatchNormaliz)	(None, 10, 10, 256)	1024	stage3_unit3_conv1[0][0]
stage3_unit3_relu2 (Activation)	(None, 10, 10, 256)	0	stage3_unit3_bn2[0][0]
zero_padding2d_21 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit3_relu2[0][0]
stage3_unit3_conv2 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_21[0][0]
add_9 (Add)	(None, 10, 10, 256)	0	stage3_unit3_conv2[0][0] add_8[0][0]

Table S1 (*continued*)

Table S1 *(continued)*

Layer (type)	Output Shape	Param #	Connected to
stage3_unit4_bn1 (BatchNormaliz)	(None, 10, 10, 256)	1024	add_9[0][0]
stage3_unit4_relu1 (Activation)	(None, 10, 10, 256)	0	stage3_unit4_bn1[0][0]
zero_padding2d_22 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit4_relu1[0][0]
stage3_unit4_conv1 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_22[0][0]
stage3_unit4_bn2 (BatchNormaliz)	(None, 10, 10, 256)	1024	stage3_unit4_conv1[0][0]
stage3_unit4_relu2 (Activation)	(None, 10, 10, 256)	0	stage3_unit4_bn2[0][0]
zero_padding2d_23 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit4_relu2[0][0]
stage3_unit4_conv2 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_23[0][0]
add_10 (Add)	(None, 10, 10, 256)	0	stage3_unit4_conv2[0][0] add_9[0][0]
stage3_unit5_bn1 (BatchNormaliz)	(None, 10, 10, 256)	1024	add_10[0][0]
stage3_unit5_relu1 (Activation)	(None, 10, 10, 256)	0	stage3_unit5_bn1[0][0]
zero_padding2d_24 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit5_relu1[0][0]
stage3_unit5_conv1 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_24[0][0]
stage3_unit5_bn2 (BatchNormaliz)	(None, 10, 10, 256)	1024	stage3_unit5_conv1[0][0]
stage3_unit5_relu2 (Activation)	(None, 10, 10, 256)	0	stage3_unit5_bn2[0][0]
zero_padding2d_25 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit5_relu2[0][0]
stage3_unit5_conv2 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_25[0][0]
add_11 (Add)	(None, 10, 10, 256)	0	stage3_unit5_conv2[0][0] add_10[0][0]
stage3_unit6_bn1 (BatchNormaliz)	(None, 10, 10, 256)	1024	add_11[0][0]
stage3_unit6_relu1 (Activation)	(None, 10, 10, 256)	0	stage3_unit6_bn1[0][0]
zero_padding2d_26 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit6_relu1[0][0]
stage3_unit6_conv1 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_26[0][0]
stage3_unit6_bn2 (BatchNormaliz)	(None, 10, 10, 256)	1024	stage3_unit6_conv1[0][0]
stage3_unit6_relu2 (Activation)	(None, 10, 10, 256)	0	stage3_unit6_bn2[0][0]
zero_padding2d_27 (ZeroPadding2)	(None, 12, 12, 256)	0	stage3_unit6_relu2[0][0]
stage3_unit6_conv2 (Conv2D)	(None, 10, 10, 256)	589824	zero_padding2d_27[0][0]
add_12 (Add)	(None, 10, 10, 256)	0	stage3_unit6_conv2[0][0] add_11[0][0]
stage4_unit1_bn1 (BatchNormaliz)	(None, 10, 10, 256)	1024	add_12[0][0]
stage4_unit1_relu1 (Activation)	(None, 10, 10, 256)	0	stage4_unit1_bn1[0][0]
zero_padding2d_28 (ZeroPadding2)	(None, 12, 12, 256)	0	stage4_unit1_relu1[0][0]
stage4_unit1_conv1 (Conv2D)	(None, 5, 5, 512)	1179648	zero_padding2d_28[0][0]
stage4_unit1_bn2 (BatchNormaliz)	(None, 5, 5, 512)	2048	stage4_unit1_conv1[0][0]
stage4_unit1_relu2 (Activation)	(None, 5, 5, 512)	0	stage4_unit1_bn2[0][0]
zero_padding2d_29 (ZeroPadding2)	(None, 7, 7, 512)	0	stage4_unit1_relu2[0][0]
stage4_unit1_conv2 (Conv2D)	(None, 5, 5, 512)	2359296	zero_padding2d_29[0][0]
stage4_unit1_sc (Conv2D)	(None, 5, 5, 512)	131072	stage4_unit1_relu1[0][0]
add_13 (Add)	(None, 5, 5, 512)	0	stage4_unit1_conv2[0][0] stage4_unit1_sc[0][0]
stage4_unit2_bn1 (BatchNormaliz)	(None, 5, 5, 512)	2048	add_13[0][0]
stage4_unit2_relu1 (Activation)	(None, 5, 5, 512)	0	stage4_unit2_bn1[0][0]
zero_padding2d_30 (ZeroPadding2)	(None, 7, 7, 512)	0	stage4_unit2_relu1[0][0]
stage4_unit2_conv1 (Conv2D)	(None, 5, 5, 512)	2359296	zero_padding2d_30[0][0]
stage4_unit2_bn2 (BatchNormaliz)	(None, 5, 5, 512)	2048	stage4_unit2_conv1[0][0]
stage4_unit2_relu2 (Activation)	(None, 5, 5, 512)	0	stage4_unit2_bn2[0][0]
zero_padding2d_31 (ZeroPadding2)	(None, 7, 7, 512)	0	stage4_unit2_relu2[0][0]
stage4_unit2_conv2 (Conv2D)	(None, 5, 5, 512)	2359296	zero_padding2d_31[0][0]
add_14 (Add)	(None, 5, 5, 512)	0	stage4_unit2_conv2[0][0] add_13[0][0]
stage4_unit3_bn1 (BatchNormaliz)	(None, 5, 5, 512)	2048	add_14[0][0]
stage4_unit3_relu1 (Activation)	(None, 5, 5, 512)	0	stage4_unit3_bn1[0][0]
zero_padding2d_32 (ZeroPadding2)	(None, 7, 7, 512)	0	stage4_unit3_relu1[0][0]
stage4_unit3_conv1 (Conv2D)	(None, 5, 5, 512)	2359296	zero_padding2d_32[0][0]
stage4_unit3_bn2 (BatchNormaliz)	(None, 5, 5, 512)	2048	stage4_unit3_conv1[0][0]
stage4_unit3_relu2 (Activation)	(None, 5, 5, 512)	0	stage4_unit3_bn2[0][0]
zero_padding2d_33 (ZeroPadding2)	(None, 7, 7, 512)	0	stage4_unit3_relu2[0][0]
stage4_unit3_conv2 (Conv2D)	(None, 5, 5, 512)	2359296	zero_padding2d_33[0][0]
add_15 (Add)	(None, 5, 5, 512)	0	stage4_unit3_conv2[0][0] add_14[0][0]
bn1 (BatchNormalization)	(None, 5, 5, 512)	2048	add_15[0][0]
relu1 (Activation)	(None, 5, 5, 512)	0	bn1[0][0]
decoder_stage0_upsampling (UpSa)	(None, 10, 10, 512)	0	relu1[0][0]
decoder_stage0_concat (Concaten)	(None, 10, 10, 768)	0	decoder_stage0_upsampling[0][0] stage4_unit1_relu1[0][0]
decoder_stage0a_conv (Conv2D)	(None, 10, 10, 256)	1769472	decoder_stage0_concat[0][0]
decoder_stage0a_bn (BatchNormal)	(None, 10, 10, 256)	1024	decoder_stage0a_conv[0][0]
decoder_stage0a_relu (Activation)	(None, 10, 10, 256)	0	decoder_stage0a_bn[0][0]
decoder_stage0b_conv (Conv2D)	(None, 10, 10, 256)	589824	decoder_stage0a_relu[0][0]
decoder_stage0b_bn (BatchNormal)	(None, 10, 10, 256)	1024	decoder_stage0b_conv[0][0]
decoder_stage0b_relu (Activation)	(None, 10, 10, 256)	0	decoder_stage0b_bn[0][0]
decoder_stage1_upsampling (UpSa)	(None, 20, 20, 256)	0	decoder_stage0b_relu[0][0]
decoder_stage1_concat (Concaten)	(None, 20, 20, 384)	0	decoder_stage1_upsampling[0][0] stage3_unit1_relu1[0][0]
decoder_stage1a_conv (Conv2D)	(None, 20, 20, 128)	442368	decoder_stage1_concat[0][0]
decoder_stage1a_bn (BatchNormal)	(None, 20, 20, 128)	512	decoder_stage1a_conv[0][0]
decoder_stage1a_relu (Activation)	(None, 20, 20, 128)	0	decoder_stage1a_bn[0][0]
decoder_stage1b_conv (Conv2D)	(None, 20, 20, 128)	147456	decoder_stage1a_relu[0][0]
decoder_stage1b_bn (BatchNormal)	(None, 20, 20, 128)	512	decoder_stage1b_conv[0][0]
decoder_stage1b_relu (Activation)	(None, 20, 20, 128)	0	decoder_stage1b_bn[0][0]
decoder_stage2_upsampling (UpSa)	(None, 40, 40, 128)	0	decoder_stage1b_relu[0][0]
decoder_stage2_concat (Concaten)	(None, 40, 40, 192)	0	decoder_stage2_upsampling[0][0] stage2_unit1_relu1[0][0]
decoder_stage2a_conv (Conv2D)	(None, 40, 40, 64)	110592	decoder_stage2_concat[0][0]
decoder_stage2a_bn (BatchNormal)	(None, 40, 40, 64)	256	decoder_stage2a_conv[0][0]
decoder_stage2a_relu (Activation)	(None, 40, 40, 64)	0	decoder_stage2a_bn[0][0]
decoder_stage2b_conv (Conv2D)	(None, 40, 40, 64)	36864	decoder_stage2a_relu[0][0]
decoder_stage2b_bn (BatchNormal)	(None, 40, 40, 64)	256	decoder_stage2b_conv[0][0]
decoder_stage2b_relu (Activation)	(None, 40, 40, 64)	0	decoder_stage2b_bn[0][0]
decoder_stage3_upsampling (UpSa)	(None, 80, 80, 64)	0	decoder_stage2b_relu[0][0]
decoder_stage3_concat (Concaten)	(None, 80, 80, 128)	0	decoder_stage3_upsampling[0][0] relu0[0][0]
decoder_stage3a_conv (Conv2D)	(None, 80, 80, 32)	36864	decoder_stage3_concat[0][0]
decoder_stage3a_bn (BatchNormal)	(None, 80, 80, 32)	128	decoder_stage3a_conv[0][0]
decoder_stage3a_relu (Activation)	(None, 80, 80, 32)	0	decoder_stage3a_bn[0][0]
decoder_stage3b_conv (Conv2D)	(None, 80, 80, 32)	9216	decoder_stage3a_relu[0][0]
decoder_stage3b_bn (BatchNormal)	(None, 80, 80, 32)	128	decoder_stage3b_conv[0][0]
decoder_stage3b_relu (Activation)	(None, 80, 80, 32)	0	decoder_stage3b_bn[0][0]
decoder_stage4_upsampling (UpSa)	(None, 160, 160, 32)	0	decoder_stage3b_relu[0][0]
decoder_stage4a_conv (Conv2D)	(None, 160, 160, 16)	4608	decoder_stage4_upsampling[0][0]
decoder_stage4a_bn (BatchNormal)	(None, 160, 160, 16)	64	decoder_stage4a_conv[0][0]
decoder_stage4a_relu (Activation)	(None, 160, 160, 16)	0	decoder_stage4a_bn[0][0]
decoder_stage4b_conv (Conv2D)	(None, 160, 160, 16)	2304	decoder_stage4a_relu[0][0]
decoder_stage4b_bn (BatchNormal)	(None, 160, 160, 16)	64	decoder_stage4b_conv[0][0]
decoder_stage4b_relu (Activation)	(None, 160, 160, 16)	0	decoder_stage4b_bn[0][0]
final_conv (Conv2D)	(None, 160, 160, 5)	725	decoder_stage4b_relu[0][0]
softmax (Activation)	(None, 160, 160, 5)	0	final_conv[0][0]