Model: "model"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Layer (type) Output Shape Param # Connected to

==================================================================================================

input\_1 (InputLayer) [(None, 64, 321, 1)] 0 []

conv2d (Conv2D) (None, 64, 321, 16) 496 ['input\_1[0][0]']

tf.math.reduce\_mean (TFOpL (None, 321, 16) 0 ['conv2d[0][0]']

ambda)

tf.math.reduce\_max (TFOpLa (None, 321, 16) 0 ['conv2d[0][0]']

mbda)

tf.expand\_dims (TFOpLambda (None, 1, 321, 16) 0 ['tf.math.reduce\_mean[0][0]']

)

tf.expand\_dims\_1 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_max[0][0]']

da)

concatenate (Concatenate) (None, 1, 321, 32) 0 ['tf.expand\_dims[0][0]',

'tf.expand\_dims\_1[0][0]']

conv2d\_1 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate[0][0]']

multiply\_1 (Multiply) (None, 64, 321, 16) 0 ['conv2d[0][0]',

'conv2d\_1[0][0]']

depthwise\_conv2d (Depthwis (None, 1, 321, 32) 2080 ['conv2d[0][0]']

eConv2D)

conv2d\_2 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_1[0][0]']

conv2d\_3 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d[0][0]']

global\_average\_pooling2d ( (None, 32) 0 ['depthwise\_conv2d[0][0]']

GlobalAveragePooling2D)

global\_max\_pooling2d (Glob (None, 32) 0 ['depthwise\_conv2d[0][0]']

alMaxPooling2D)

global\_average\_pooling2d\_1 (None, 16) 0 ['conv2d\_2[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_1 (Gl (None, 16) 0 ['conv2d\_2[0][0]']

obalMaxPooling2D)

global\_average\_pooling2d\_2 (None, 16) 0 ['conv2d\_3[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_2 (Gl (None, 16) 0 ['conv2d\_3[0][0]']

obalMaxPooling2D)

dense (Dense) (None, 4) 128 ['global\_average\_pooling2d[0][

0]',

'global\_max\_pooling2d[0][0]']

dense\_2 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_1[0

][0]',

'global\_max\_pooling2d\_1[0][0]

']

dense\_4 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_2[0

][0]',

'global\_max\_pooling2d\_2[0][0]

']

dense\_1 (Dense) (None, 32) 128 ['dense[0][0]',

'dense[1][0]']

dense\_3 (Dense) (None, 16) 64 ['dense\_2[0][0]',

'dense\_2[1][0]']

dense\_5 (Dense) (None, 16) 64 ['dense\_4[0][0]',

'dense\_4[1][0]']

tf.\_\_operators\_\_.add (TFOp (None, 32) 0 ['dense\_1[0][0]',

Lambda) 'dense\_1[1][0]']

tf.\_\_operators\_\_.add\_1 (TF (None, 16) 0 ['dense\_3[0][0]',

OpLambda) 'dense\_3[1][0]']

tf.\_\_operators\_\_.add\_2 (TF (None, 16) 0 ['dense\_5[0][0]',

OpLambda) 'dense\_5[1][0]']

activation (Activation) (None, 32) 0 ['tf.\_\_operators\_\_.add[0][0]']

activation\_1 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_1[0][0]

']

activation\_2 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_2[0][0]

']

multiply (Multiply) (None, 1, 321, 32) 0 ['depthwise\_conv2d[0][0]',

'activation[0][0]']

multiply\_2 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_2[0][0]',

'activation\_1[0][0]']

multiply\_3 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_3[0][0]',

'activation\_2[0][0]']

concatenate\_1 (Concatenate (None, 1, 321, 64) 0 ['multiply[0][0]',

) 'multiply\_2[0][0]',

'multiply\_3[0][0]']

average\_pooling2d (Average (None, 1, 21, 64) 0 ['concatenate\_1[0][0]']

Pooling2D)

flatten (Flatten) (None, 1344) 0 ['average\_pooling2d[0][0]']

dense\_6 (Dense) (None, 80) 107600 ['flatten[0][0]']

dense\_7 (Dense) (None, 4) 324 ['dense\_6[0][0]']

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Total params: 145861 (569.77 KB)

Trainable params: 145861 (569.77 KB)

Non-trainable params: 0 (0.00 Byte)

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Epoch 1/10

353/353 - 29s - loss: 1.3220 - accuracy: 0.3266 - val\_loss: 1.1664 - val\_accuracy: 0.4663 - 29s/epoch - 81ms/step

Epoch 2/10

353/353 - 26s - loss: 1.1606 - accuracy: 0.5006 - val\_loss: 1.1113 - val\_accuracy: 0.5457 - 26s/epoch - 74ms/step

Epoch 3/10

353/353 - 26s - loss: 1.1184 - accuracy: 0.5203 - val\_loss: 1.1041 - val\_accuracy: 0.5358 - 26s/epoch - 73ms/step

Epoch 4/10

353/353 - 26s - loss: 1.0928 - accuracy: 0.5419 - val\_loss: 1.0929 - val\_accuracy: 0.5478 - 26s/epoch - 73ms/step

Epoch 5/10

353/353 - 26s - loss: 1.0634 - accuracy: 0.5582 - val\_loss: 1.0704 - val\_accuracy: 0.5571 - 26s/epoch - 74ms/step

Epoch 6/10

353/353 - 26s - loss: 1.0394 - accuracy: 0.5719 - val\_loss: 1.0505 - val\_accuracy: 0.5726 - 26s/epoch - 73ms/step

Epoch 7/10

353/353 - 26s - loss: 1.0194 - accuracy: 0.5864 - val\_loss: 1.0657 - val\_accuracy: 0.5627 - 26s/epoch - 74ms/step

Epoch 8/10

353/353 - 26s - loss: 0.9943 - accuracy: 0.5949 - val\_loss: 1.0782 - val\_accuracy: 0.5493 - 26s/epoch - 74ms/step

Epoch 9/10

353/353 - 26s - loss: 0.9761 - accuracy: 0.6004 - val\_loss: 1.0225 - val\_accuracy: 0.5996 - 26s/epoch - 74ms/step

Epoch 10/10

353/353 - 26s - loss: 0.9536 - accuracy: 0.6179 - val\_loss: 1.0287 - val\_accuracy: 0.5854 - 26s/epoch - 74ms/step

56/56 - 2s - loss: 1.0245 - accuracy: 0.5799 - 2s/epoch - 28ms/step

Test loss: 1.0244992971420288

Test accuracy: 0.5799319744110107

56/56 [==============================] - 2s 26ms/step

Model: "model\_1"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Layer (type) Output Shape Param # Connected to

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input\_2 (InputLayer) [(None, 64, 321, 1)] 0 []

conv2d\_4 (Conv2D) (None, 64, 321, 16) 496 ['input\_2[0][0]']

tf.math.reduce\_mean\_1 (TFO (None, 321, 16) 0 ['conv2d\_4[0][0]']

pLambda)

tf.math.reduce\_max\_1 (TFOp (None, 321, 16) 0 ['conv2d\_4[0][0]']

Lambda)

tf.expand\_dims\_2 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_mean\_1[0][0]'

da) ]

tf.expand\_dims\_3 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_max\_1[0][0]']

da)

concatenate\_2 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_2[0][0]',

) 'tf.expand\_dims\_3[0][0]']

conv2d\_5 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_2[0][0]']

multiply\_5 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_4[0][0]',

'conv2d\_5[0][0]']

depthwise\_conv2d\_1 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_4[0][0]']

iseConv2D)

conv2d\_6 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_5[0][0]']

conv2d\_7 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_4[0][0]']

global\_average\_pooling2d\_3 (None, 32) 0 ['depthwise\_conv2d\_1[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_3 (Gl (None, 32) 0 ['depthwise\_conv2d\_1[0][0]']

obalMaxPooling2D)

global\_average\_pooling2d\_4 (None, 16) 0 ['conv2d\_6[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_4 (Gl (None, 16) 0 ['conv2d\_6[0][0]']

obalMaxPooling2D)

global\_average\_pooling2d\_5 (None, 16) 0 ['conv2d\_7[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_5 (Gl (None, 16) 0 ['conv2d\_7[0][0]']

obalMaxPooling2D)

dense\_8 (Dense) (None, 4) 128 ['global\_average\_pooling2d\_3[0

][0]',

'global\_max\_pooling2d\_3[0][0]

']

dense\_10 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_4[0

][0]',

'global\_max\_pooling2d\_4[0][0]

']

dense\_12 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_5[0

][0]',

'global\_max\_pooling2d\_5[0][0]

']

dense\_9 (Dense) (None, 32) 128 ['dense\_8[0][0]',

'dense\_8[1][0]']

dense\_11 (Dense) (None, 16) 64 ['dense\_10[0][0]',

'dense\_10[1][0]']

dense\_13 (Dense) (None, 16) 64 ['dense\_12[0][0]',

'dense\_12[1][0]']

tf.\_\_operators\_\_.add\_3 (TF (None, 32) 0 ['dense\_9[0][0]',

OpLambda) 'dense\_9[1][0]']

tf.\_\_operators\_\_.add\_4 (TF (None, 16) 0 ['dense\_11[0][0]',

OpLambda) 'dense\_11[1][0]']

tf.\_\_operators\_\_.add\_5 (TF (None, 16) 0 ['dense\_13[0][0]',

OpLambda) 'dense\_13[1][0]']

activation\_3 (Activation) (None, 32) 0 ['tf.\_\_operators\_\_.add\_3[0][0]

']

activation\_4 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_4[0][0]

']

activation\_5 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_5[0][0]

']

multiply\_4 (Multiply) (None, 1, 321, 32) 0 ['depthwise\_conv2d\_1[0][0]',

'activation\_3[0][0]']

multiply\_6 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_6[0][0]',

'activation\_4[0][0]']

multiply\_7 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_7[0][0]',

'activation\_5[0][0]']

concatenate\_3 (Concatenate (None, 1, 321, 64) 0 ['multiply\_4[0][0]',

) 'multiply\_6[0][0]',

'multiply\_7[0][0]']

average\_pooling2d\_1 (Avera (None, 1, 21, 64) 0 ['concatenate\_3[0][0]']

gePooling2D)

flatten\_1 (Flatten) (None, 1344) 0 ['average\_pooling2d\_1[0][0]']

dense\_14 (Dense) (None, 80) 107600 ['flatten\_1[0][0]']

dense\_15 (Dense) (None, 4) 324 ['dense\_14[0][0]']

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Total params: 145861 (569.77 KB)

Trainable params: 145861 (569.77 KB)

Non-trainable params: 0 (0.00 Byte)

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Epoch 1/10

353/353 - 27s - loss: 1.2777 - accuracy: 0.3730 - val\_loss: 1.1702 - val\_accuracy: 0.4748 - 27s/epoch - 77ms/step

Epoch 2/10

353/353 - 25s - loss: 1.1334 - accuracy: 0.5104 - val\_loss: 1.0905 - val\_accuracy: 0.5315 - 25s/epoch - 70ms/step

Epoch 3/10

353/353 - 25s - loss: 1.0901 - accuracy: 0.5421 - val\_loss: 1.1331 - val\_accuracy: 0.5351 - 25s/epoch - 71ms/step

Epoch 4/10

353/353 - 25s - loss: 1.0492 - accuracy: 0.5791 - val\_loss: 1.0460 - val\_accuracy: 0.5698 - 25s/epoch - 71ms/step

Epoch 5/10

353/353 - 25s - loss: 1.0142 - accuracy: 0.5921 - val\_loss: 1.0326 - val\_accuracy: 0.5762 - 25s/epoch - 71ms/step

Epoch 6/10

353/353 - 25s - loss: 0.9909 - accuracy: 0.6045 - val\_loss: 1.0257 - val\_accuracy: 0.5705 - 25s/epoch - 71ms/step

Epoch 7/10

353/353 - 25s - loss: 0.9666 - accuracy: 0.6096 - val\_loss: 1.0120 - val\_accuracy: 0.5889 - 25s/epoch - 70ms/step

Epoch 8/10

353/353 - 25s - loss: 0.9544 - accuracy: 0.6170 - val\_loss: 1.0196 - val\_accuracy: 0.5819 - 25s/epoch - 70ms/step

Epoch 9/10

353/353 - 25s - loss: 0.9290 - accuracy: 0.6275 - val\_loss: 1.0175 - val\_accuracy: 0.5819 - 25s/epoch - 71ms/step

Epoch 10/10

353/353 - 26s - loss: 0.9127 - accuracy: 0.6383 - val\_loss: 1.0140 - val\_accuracy: 0.5748 - 26s/epoch - 72ms/step

56/56 - 2s - loss: 1.0603 - accuracy: 0.5601 - 2s/epoch - 30ms/step

Test loss: 1.0603172779083252

Test accuracy: 0.5600907206535339

56/56 [==============================] - 1s 24ms/step

Model: "model\_2"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Layer (type) Output Shape Param # Connected to

==================================================================================================

input\_3 (InputLayer) [(None, 64, 321, 1)] 0 []

conv2d\_8 (Conv2D) (None, 64, 321, 16) 496 ['input\_3[0][0]']

tf.math.reduce\_mean\_2 (TFO (None, 321, 16) 0 ['conv2d\_8[0][0]']

pLambda)

tf.math.reduce\_max\_2 (TFOp (None, 321, 16) 0 ['conv2d\_8[0][0]']

Lambda)

tf.expand\_dims\_4 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_mean\_2[0][0]'

da) ]

tf.expand\_dims\_5 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_max\_2[0][0]']

da)

concatenate\_4 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_4[0][0]',

) 'tf.expand\_dims\_5[0][0]']

conv2d\_9 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_4[0][0]']

multiply\_9 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_8[0][0]',

'conv2d\_9[0][0]']

depthwise\_conv2d\_2 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_8[0][0]']

iseConv2D)

conv2d\_10 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_9[0][0]']

conv2d\_11 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_8[0][0]']

global\_average\_pooling2d\_6 (None, 32) 0 ['depthwise\_conv2d\_2[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_6 (Gl (None, 32) 0 ['depthwise\_conv2d\_2[0][0]']

obalMaxPooling2D)

global\_average\_pooling2d\_7 (None, 16) 0 ['conv2d\_10[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_7 (Gl (None, 16) 0 ['conv2d\_10[0][0]']

obalMaxPooling2D)

global\_average\_pooling2d\_8 (None, 16) 0 ['conv2d\_11[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_8 (Gl (None, 16) 0 ['conv2d\_11[0][0]']

obalMaxPooling2D)

dense\_16 (Dense) (None, 4) 128 ['global\_average\_pooling2d\_6[0

][0]',

'global\_max\_pooling2d\_6[0][0]

']

dense\_18 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_7[0

][0]',

'global\_max\_pooling2d\_7[0][0]

']

dense\_20 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_8[0

][0]',

'global\_max\_pooling2d\_8[0][0]

']

dense\_17 (Dense) (None, 32) 128 ['dense\_16[0][0]',

'dense\_16[1][0]']

dense\_19 (Dense) (None, 16) 64 ['dense\_18[0][0]',

'dense\_18[1][0]']

dense\_21 (Dense) (None, 16) 64 ['dense\_20[0][0]',

'dense\_20[1][0]']

tf.\_\_operators\_\_.add\_6 (TF (None, 32) 0 ['dense\_17[0][0]',

OpLambda) 'dense\_17[1][0]']

tf.\_\_operators\_\_.add\_7 (TF (None, 16) 0 ['dense\_19[0][0]',

OpLambda) 'dense\_19[1][0]']

tf.\_\_operators\_\_.add\_8 (TF (None, 16) 0 ['dense\_21[0][0]',

OpLambda) 'dense\_21[1][0]']

activation\_6 (Activation) (None, 32) 0 ['tf.\_\_operators\_\_.add\_6[0][0]

']

activation\_7 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_7[0][0]

']

activation\_8 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_8[0][0]

']

multiply\_8 (Multiply) (None, 1, 321, 32) 0 ['depthwise\_conv2d\_2[0][0]',

'activation\_6[0][0]']

multiply\_10 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_10[0][0]',

'activation\_7[0][0]']

multiply\_11 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_11[0][0]',

'activation\_8[0][0]']

concatenate\_5 (Concatenate (None, 1, 321, 64) 0 ['multiply\_8[0][0]',

) 'multiply\_10[0][0]',

'multiply\_11[0][0]']

average\_pooling2d\_2 (Avera (None, 1, 21, 64) 0 ['concatenate\_5[0][0]']

gePooling2D)

flatten\_2 (Flatten) (None, 1344) 0 ['average\_pooling2d\_2[0][0]']

dense\_22 (Dense) (None, 80) 107600 ['flatten\_2[0][0]']

dense\_23 (Dense) (None, 4) 324 ['dense\_22[0][0]']

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Total params: 145861 (569.77 KB)

Trainable params: 145861 (569.77 KB)

Non-trainable params: 0 (0.00 Byte)

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Epoch 1/10

353/353 - 27s - loss: 1.3004 - accuracy: 0.3682 - val\_loss: 1.1955 - val\_accuracy: 0.4394 - 27s/epoch - 77ms/step

Epoch 2/10

353/353 - 25s - loss: 1.1653 - accuracy: 0.4848 - val\_loss: 1.1212 - val\_accuracy: 0.5131 - 25s/epoch - 70ms/step

Epoch 3/10

353/353 - 25s - loss: 1.1040 - accuracy: 0.5423 - val\_loss: 1.1057 - val\_accuracy: 0.5266 - 25s/epoch - 70ms/step

Epoch 4/10

353/353 - 25s - loss: 1.0706 - accuracy: 0.5566 - val\_loss: 1.0786 - val\_accuracy: 0.5485 - 25s/epoch - 71ms/step

Epoch 5/10

353/353 - 25s - loss: 1.0413 - accuracy: 0.5782 - val\_loss: 1.0471 - val\_accuracy: 0.5641 - 25s/epoch - 72ms/step

Epoch 6/10

353/353 - 24s - loss: 1.0146 - accuracy: 0.5924 - val\_loss: 1.0549 - val\_accuracy: 0.5769 - 24s/epoch - 69ms/step

Epoch 7/10

353/353 - 25s - loss: 0.9911 - accuracy: 0.6006 - val\_loss: 1.0279 - val\_accuracy: 0.5840 - 25s/epoch - 69ms/step

Epoch 8/10

353/353 - 25s - loss: 0.9609 - accuracy: 0.6172 - val\_loss: 1.0339 - val\_accuracy: 0.5833 - 25s/epoch - 70ms/step

Epoch 9/10

353/353 - 25s - loss: 0.9433 - accuracy: 0.6213 - val\_loss: 1.0350 - val\_accuracy: 0.5783 - 25s/epoch - 71ms/step

Epoch 10/10

353/353 - 25s - loss: 0.9204 - accuracy: 0.6319 - val\_loss: 1.0221 - val\_accuracy: 0.5776 - 25s/epoch - 71ms/step

56/56 - 2s - loss: 0.9748 - accuracy: 0.5941 - 2s/epoch - 28ms/step

Test loss: 0.9748368859291077

Test accuracy: 0.5941042900085449

56/56 [==============================] - 2s 26ms/step

Model: "model\_3"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Layer (type) Output Shape Param # Connected to

==================================================================================================

input\_4 (InputLayer) [(None, 64, 321, 1)] 0 []

conv2d\_12 (Conv2D) (None, 64, 321, 16) 496 ['input\_4[0][0]']

tf.math.reduce\_mean\_3 (TFO (None, 321, 16) 0 ['conv2d\_12[0][0]']

pLambda)

tf.math.reduce\_max\_3 (TFOp (None, 321, 16) 0 ['conv2d\_12[0][0]']

Lambda)

tf.expand\_dims\_6 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_mean\_3[0][0]'

da) ]

tf.expand\_dims\_7 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_max\_3[0][0]']

da)

concatenate\_6 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_6[0][0]',

) 'tf.expand\_dims\_7[0][0]']

conv2d\_13 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_6[0][0]']

multiply\_13 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_12[0][0]',

'conv2d\_13[0][0]']

depthwise\_conv2d\_3 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_12[0][0]']

iseConv2D)

conv2d\_14 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_13[0][0]']

conv2d\_15 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_12[0][0]']

global\_average\_pooling2d\_9 (None, 32) 0 ['depthwise\_conv2d\_3[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_9 (Gl (None, 32) 0 ['depthwise\_conv2d\_3[0][0]']

obalMaxPooling2D)

global\_average\_pooling2d\_1 (None, 16) 0 ['conv2d\_14[0][0]']

0 (GlobalAveragePooling2D)

global\_max\_pooling2d\_10 (G (None, 16) 0 ['conv2d\_14[0][0]']

lobalMaxPooling2D)

global\_average\_pooling2d\_1 (None, 16) 0 ['conv2d\_15[0][0]']

1 (GlobalAveragePooling2D)

global\_max\_pooling2d\_11 (G (None, 16) 0 ['conv2d\_15[0][0]']

lobalMaxPooling2D)

dense\_24 (Dense) (None, 4) 128 ['global\_average\_pooling2d\_9[0

][0]',

'global\_max\_pooling2d\_9[0][0]

']

dense\_26 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_10[

0][0]',

'global\_max\_pooling2d\_10[0][0

]']

dense\_28 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_11[

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'global\_max\_pooling2d\_11[0][0

]']

dense\_25 (Dense) (None, 32) 128 ['dense\_24[0][0]',

'dense\_24[1][0]']

dense\_27 (Dense) (None, 16) 64 ['dense\_26[0][0]',

'dense\_26[1][0]']

dense\_29 (Dense) (None, 16) 64 ['dense\_28[0][0]',

'dense\_28[1][0]']

tf.\_\_operators\_\_.add\_9 (TF (None, 32) 0 ['dense\_25[0][0]',

OpLambda) 'dense\_25[1][0]']

tf.\_\_operators\_\_.add\_10 (T (None, 16) 0 ['dense\_27[0][0]',

FOpLambda) 'dense\_27[1][0]']

tf.\_\_operators\_\_.add\_11 (T (None, 16) 0 ['dense\_29[0][0]',

FOpLambda) 'dense\_29[1][0]']

activation\_9 (Activation) (None, 32) 0 ['tf.\_\_operators\_\_.add\_9[0][0]

']

activation\_10 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_10[0][0

]']

activation\_11 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_11[0][0

]']

multiply\_12 (Multiply) (None, 1, 321, 32) 0 ['depthwise\_conv2d\_3[0][0]',

'activation\_9[0][0]']

multiply\_14 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_14[0][0]',

'activation\_10[0][0]']

multiply\_15 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_15[0][0]',

'activation\_11[0][0]']

concatenate\_7 (Concatenate (None, 1, 321, 64) 0 ['multiply\_12[0][0]',

) 'multiply\_14[0][0]',

'multiply\_15[0][0]']

average\_pooling2d\_3 (Avera (None, 1, 21, 64) 0 ['concatenate\_7[0][0]']

gePooling2D)

flatten\_3 (Flatten) (None, 1344) 0 ['average\_pooling2d\_3[0][0]']

dense\_30 (Dense) (None, 80) 107600 ['flatten\_3[0][0]']

dense\_31 (Dense) (None, 4) 324 ['dense\_30[0][0]']

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Total params: 145861 (569.77 KB)

Trainable params: 145861 (569.77 KB)

Non-trainable params: 0 (0.00 Byte)

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Epoch 1/10

353/353 - 27s - loss: 1.2864 - accuracy: 0.3721 - val\_loss: 1.1713 - val\_accuracy: 0.4543 - 27s/epoch - 77ms/step

Epoch 2/10

353/353 - 25s - loss: 1.1235 - accuracy: 0.5136 - val\_loss: 1.1086 - val\_accuracy: 0.5152 - 25s/epoch - 70ms/step

Epoch 3/10

353/353 - 25s - loss: 1.0646 - accuracy: 0.5541 - val\_loss: 1.0731 - val\_accuracy: 0.5514 - 25s/epoch - 71ms/step

Epoch 4/10

353/353 - 25s - loss: 1.0255 - accuracy: 0.5830 - val\_loss: 1.0461 - val\_accuracy: 0.5684 - 25s/epoch - 72ms/step

Epoch 5/10

353/353 - 25s - loss: 0.9981 - accuracy: 0.5979 - val\_loss: 1.0316 - val\_accuracy: 0.5776 - 25s/epoch - 70ms/step

Epoch 6/10

353/353 - 25s - loss: 0.9768 - accuracy: 0.6096 - val\_loss: 1.0215 - val\_accuracy: 0.5726 - 25s/epoch - 71ms/step

Epoch 7/10

353/353 - 25s - loss: 0.9495 - accuracy: 0.6181 - val\_loss: 1.0210 - val\_accuracy: 0.5826 - 25s/epoch - 70ms/step

Epoch 8/10

353/353 - 25s - loss: 0.9324 - accuracy: 0.6256 - val\_loss: 1.0132 - val\_accuracy: 0.5840 - 25s/epoch - 71ms/step

Epoch 9/10

353/353 - 25s - loss: 0.9033 - accuracy: 0.6408 - val\_loss: 1.0131 - val\_accuracy: 0.5748 - 25s/epoch - 71ms/step

Epoch 10/10

353/353 - 25s - loss: 0.8828 - accuracy: 0.6468 - val\_loss: 0.9922 - val\_accuracy: 0.5847 - 25s/epoch - 71ms/step

56/56 - 2s - loss: 1.1398 - accuracy: 0.5357 - 2s/epoch - 29ms/step

Test loss: 1.1397875547409058

Test accuracy: 0.5357142686843872

56/56 [==============================] - 2s 28ms/step

Model: "model\_4"

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Layer (type) Output Shape Param # Connected to

==================================================================================================

input\_5 (InputLayer) [(None, 64, 321, 1)] 0 []

conv2d\_16 (Conv2D) (None, 64, 321, 16) 496 ['input\_5[0][0]']

tf.math.reduce\_mean\_4 (TFO (None, 321, 16) 0 ['conv2d\_16[0][0]']

pLambda)

tf.math.reduce\_max\_4 (TFOp (None, 321, 16) 0 ['conv2d\_16[0][0]']

Lambda)

tf.expand\_dims\_8 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_mean\_4[0][0]'

da) ]

tf.expand\_dims\_9 (TFOpLamb (None, 1, 321, 16) 0 ['tf.math.reduce\_max\_4[0][0]']

da)

concatenate\_8 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_8[0][0]',

) 'tf.expand\_dims\_9[0][0]']

conv2d\_17 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_8[0][0]']

multiply\_17 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_16[0][0]',

'conv2d\_17[0][0]']

depthwise\_conv2d\_4 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_16[0][0]']

iseConv2D)

conv2d\_18 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_17[0][0]']

conv2d\_19 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_16[0][0]']

global\_average\_pooling2d\_1 (None, 32) 0 ['depthwise\_conv2d\_4[0][0]']

2 (GlobalAveragePooling2D)

global\_max\_pooling2d\_12 (G (None, 32) 0 ['depthwise\_conv2d\_4[0][0]']

lobalMaxPooling2D)

global\_average\_pooling2d\_1 (None, 16) 0 ['conv2d\_18[0][0]']

3 (GlobalAveragePooling2D)

global\_max\_pooling2d\_13 (G (None, 16) 0 ['conv2d\_18[0][0]']

lobalMaxPooling2D)

global\_average\_pooling2d\_1 (None, 16) 0 ['conv2d\_19[0][0]']

4 (GlobalAveragePooling2D)

global\_max\_pooling2d\_14 (G (None, 16) 0 ['conv2d\_19[0][0]']

lobalMaxPooling2D)

dense\_32 (Dense) (None, 4) 128 ['global\_average\_pooling2d\_12[

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'global\_max\_pooling2d\_12[0][0

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dense\_34 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_13[

0][0]',

'global\_max\_pooling2d\_13[0][0

]']

dense\_36 (Dense) (None, 4) 64 ['global\_average\_pooling2d\_14[

0][0]',

'global\_max\_pooling2d\_14[0][0

]']

dense\_33 (Dense) (None, 32) 128 ['dense\_32[0][0]',

'dense\_32[1][0]']

dense\_35 (Dense) (None, 16) 64 ['dense\_34[0][0]',

'dense\_34[1][0]']

dense\_37 (Dense) (None, 16) 64 ['dense\_36[0][0]',

'dense\_36[1][0]']

tf.\_\_operators\_\_.add\_12 (T (None, 32) 0 ['dense\_33[0][0]',

FOpLambda) 'dense\_33[1][0]']

tf.\_\_operators\_\_.add\_13 (T (None, 16) 0 ['dense\_35[0][0]',

FOpLambda) 'dense\_35[1][0]']

tf.\_\_operators\_\_.add\_14 (T (None, 16) 0 ['dense\_37[0][0]',

FOpLambda) 'dense\_37[1][0]']

activation\_12 (Activation) (None, 32) 0 ['tf.\_\_operators\_\_.add\_12[0][0

]']

activation\_13 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_13[0][0

]']

activation\_14 (Activation) (None, 16) 0 ['tf.\_\_operators\_\_.add\_14[0][0

]']

multiply\_16 (Multiply) (None, 1, 321, 32) 0 ['depthwise\_conv2d\_4[0][0]',

'activation\_12[0][0]']

multiply\_18 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_18[0][0]',

'activation\_13[0][0]']

multiply\_19 (Multiply) (None, 1, 321, 16) 0 ['conv2d\_19[0][0]',

'activation\_14[0][0]']

concatenate\_9 (Concatenate (None, 1, 321, 64) 0 ['multiply\_16[0][0]',

) 'multiply\_18[0][0]',

'multiply\_19[0][0]']

average\_pooling2d\_4 (Avera (None, 1, 21, 64) 0 ['concatenate\_9[0][0]']

gePooling2D)

flatten\_4 (Flatten) (None, 1344) 0 ['average\_pooling2d\_4[0][0]']

dense\_38 (Dense) (None, 80) 107600 ['flatten\_4[0][0]']

dense\_39 (Dense) (None, 4) 324 ['dense\_38[0][0]']

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Total params: 145861 (569.77 KB)

Trainable params: 145861 (569.77 KB)

Non-trainable params: 0 (0.00 Byte)

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Epoch 1/10

353/353 - 27s - loss: 1.2907 - accuracy: 0.3653 - val\_loss: 1.2018 - val\_accuracy: 0.4384 - 27s/epoch - 76ms/step

Epoch 2/10

353/353 - 25s - loss: 1.1486 - accuracy: 0.4918 - val\_loss: 1.1569 - val\_accuracy: 0.4993 - 25s/epoch - 71ms/step

Epoch 3/10

353/353 - 25s - loss: 1.0972 - accuracy: 0.5390 - val\_loss: 1.1317 - val\_accuracy: 0.5220 - 25s/epoch - 71ms/step

Epoch 4/10

353/353 - 25s - loss: 1.0593 - accuracy: 0.5585 - val\_loss: 1.0917 - val\_accuracy: 0.5588 - 25s/epoch - 71ms/step

Epoch 5/10

353/353 - 25s - loss: 1.0327 - accuracy: 0.5726 - val\_loss: 1.1126 - val\_accuracy: 0.5602 - 25s/epoch - 70ms/step

Epoch 6/10

353/353 - 25s - loss: 1.0026 - accuracy: 0.5907 - val\_loss: 1.0396 - val\_accuracy: 0.5836 - 25s/epoch - 71ms/step

Epoch 7/10

353/353 - 25s - loss: 0.9837 - accuracy: 0.6017 - val\_loss: 1.0522 - val\_accuracy: 0.5644 - 25s/epoch - 70ms/step

Epoch 8/10

353/353 - 25s - loss: 0.9624 - accuracy: 0.6063 - val\_loss: 1.0649 - val\_accuracy: 0.5701 - 25s/epoch - 71ms/step

Epoch 9/10

353/353 - 25s - loss: 0.9420 - accuracy: 0.6187 - val\_loss: 1.0524 - val\_accuracy: 0.5779 - 25s/epoch - 71ms/step

Epoch 10/10

353/353 - 25s - loss: 0.9238 - accuracy: 0.6226 - val\_loss: 1.0407 - val\_accuracy: 0.5680 - 25s/epoch - 71ms/step

56/56 - 1s - loss: 1.0217 - accuracy: 0.5925 - 1s/epoch - 26ms/step

Test loss: 1.0217176675796509

Test accuracy: 0.5925084948539734

56/56 [==============================] - 2s 25ms/step

Mean loss: 1.0442317366600036

Mean accuracy: 0.57246994972229

[nagni@euclid ONLAB]$