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\_4 (Conv2D) (None, 64, 321, 8) 640 ['input\_1[0][0]']

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

batch\_normalization (Batch (None, 64, 321, 8) 32 ['conv2d\_4[0][0]']

Normalization)

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

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

depthwise\_conv2d\_1 (Depthw (None, 1, 321, 16) 1024 ['batch\_normalization[0][0]']

iseConv2D)

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

eConv2D)

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

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

batch\_normalization\_1 (Bat (None, 1, 321, 16) 64 ['depthwise\_conv2d\_1[0][0]']

chNormalization)

concatenate\_1 (Concatenate (None, 1, 321, 64) 0 ['depthwise\_conv2d[0][0]',

) 'conv2d\_2[0][0]',

'conv2d\_3[0][0]']

activation\_1 (Activation) (None, 1, 321, 16) 0 ['batch\_normalization\_1[0][0]'

]

global\_average\_pooling2d ( (None, 64) 0 ['concatenate\_1[0][0]']

GlobalAveragePooling2D)

global\_max\_pooling2d (Glob (None, 64) 0 ['concatenate\_1[0][0]']

alMaxPooling2D)

average\_pooling2d\_1 (Avera (None, 1, 80, 16) 0 ['activation\_1[0][0]']

gePooling2D)

dense (Dense) (None, 8) 512 ['global\_average\_pooling2d[0][

0]',

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

dropout (Dropout) (None, 1, 80, 16) 0 ['average\_pooling2d\_1[0][0]']

dense\_1 (Dense) (None, 64) 512 ['dense[0][0]',

'dense[1][0]']

separable\_conv2d (Separabl (None, 1, 80, 16) 512 ['dropout[0][0]']

eConv2D)

tf.\_\_operators\_\_.add (TFOp (None, 64) 0 ['dense\_1[0][0]',

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

batch\_normalization\_2 (Bat (None, 1, 80, 16) 64 ['separable\_conv2d[0][0]']

chNormalization)

activation (Activation) (None, 64) 0 ['tf.\_\_operators\_\_.add[0][0]']

activation\_2 (Activation) (None, 1, 80, 16) 0 ['batch\_normalization\_2[0][0]'

]

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

'activation[0][0]']

average\_pooling2d\_2 (Avera (None, 1, 10, 16) 0 ['activation\_2[0][0]']

gePooling2D)

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

Pooling2D)

dropout\_1 (Dropout) (None, 1, 10, 16) 0 ['average\_pooling2d\_2[0][0]']

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

flatten\_1 (Flatten) (None, 160) 0 ['dropout\_1[0][0]']

concatenate\_2 (Concatenate (None, 1504) 0 ['flatten[0][0]',

) 'flatten\_1[0][0]']

dense\_2 (Dense) (None, 80) 120400 ['concatenate\_2[0][0]']

dense\_3 (Dense) (None, 4) 324 ['dense\_2[0][0]']

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Total params: 161509 (630.89 KB)

Trainable params: 161429 (630.58 KB)

Non-trainable params: 80 (320.00 Byte)

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

Epoch 1/10

353/353 - 63s - loss: 1.2055 - accuracy: 0.4558 - val\_loss: 1.1255 - val\_accuracy: 0.5337 - 63s/epoch - 178ms/step

Epoch 2/10

353/353 - 60s - loss: 1.1159 - accuracy: 0.5322 - val\_loss: 1.0834 - val\_accuracy: 0.5386 - 60s/epoch - 171ms/step

Epoch 3/10

353/353 - 60s - loss: 1.0576 - accuracy: 0.5701 - val\_loss: 1.0512 - val\_accuracy: 0.5677 - 60s/epoch - 170ms/step

Epoch 4/10

353/353 - 60s - loss: 1.0269 - accuracy: 0.5813 - val\_loss: 1.0375 - val\_accuracy: 0.5705 - 60s/epoch - 170ms/step

Epoch 5/10

353/353 - 60s - loss: 1.0057 - accuracy: 0.5867 - val\_loss: 1.0420 - val\_accuracy: 0.5684 - 60s/epoch - 170ms/step

Epoch 6/10

353/353 - 60s - loss: 0.9749 - accuracy: 0.6046 - val\_loss: 1.0014 - val\_accuracy: 0.5939 - 60s/epoch - 169ms/step

Epoch 7/10

353/353 - 60s - loss: 0.9560 - accuracy: 0.6192 - val\_loss: 0.9921 - val\_accuracy: 0.6045 - 60s/epoch - 169ms/step

Epoch 8/10

353/353 - 60s - loss: 0.9379 - accuracy: 0.6259 - val\_loss: 0.9820 - val\_accuracy: 0.5982 - 60s/epoch - 171ms/step

Epoch 9/10

353/353 - 60s - loss: 0.9076 - accuracy: 0.6362 - val\_loss: 1.0077 - val\_accuracy: 0.5946 - 60s/epoch - 171ms/step

Epoch 10/10

353/353 - 60s - loss: 0.8806 - accuracy: 0.6472 - val\_loss: 0.9906 - val\_accuracy: 0.6003 - 60s/epoch - 171ms/step

56/56 - 2s - loss: 0.9625 - accuracy: 0.6122 - 2s/epoch - 32ms/step

Test loss: 0.9624907374382019

Test accuracy: 0.6122449040412903

56/56 [==============================] - 2s 34ms/step

Model: "model\_1"

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

Layer (type) Output Shape Param # Connected to

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

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

conv2d\_5 (Conv2D) (None, 64, 321, 16) 496 ['input\_2[0][0]']

tf.math.reduce\_mean\_1 (TFO (None, 321, 16) 0 ['conv2d\_5[0][0]']

pLambda)

tf.math.reduce\_max\_1 (TFOp (None, 321, 16) 0 ['conv2d\_5[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\_3 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_2[0][0]',

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

conv2d\_9 (Conv2D) (None, 64, 321, 8) 640 ['input\_2[0][0]']

conv2d\_6 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_3[0][0]']

batch\_normalization\_3 (Bat (None, 64, 321, 8) 32 ['conv2d\_9[0][0]']

chNormalization)

multiply\_2 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_5[0][0]',

'conv2d\_6[0][0]']

depthwise\_conv2d\_3 (Depthw (None, 1, 321, 16) 1024 ['batch\_normalization\_3[0][0]'

iseConv2D) ]

depthwise\_conv2d\_2 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_5[0][0]']

iseConv2D)

conv2d\_7 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_2[0][0]']

conv2d\_8 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_5[0][0]']

batch\_normalization\_4 (Bat (None, 1, 321, 16) 64 ['depthwise\_conv2d\_3[0][0]']

chNormalization)

concatenate\_4 (Concatenate (None, 1, 321, 64) 0 ['depthwise\_conv2d\_2[0][0]',

) 'conv2d\_7[0][0]',

'conv2d\_8[0][0]']

activation\_4 (Activation) (None, 1, 321, 16) 0 ['batch\_normalization\_4[0][0]'

]

global\_average\_pooling2d\_1 (None, 64) 0 ['concatenate\_4[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_1 (Gl (None, 64) 0 ['concatenate\_4[0][0]']

obalMaxPooling2D)

average\_pooling2d\_4 (Avera (None, 1, 80, 16) 0 ['activation\_4[0][0]']

gePooling2D)

dense\_4 (Dense) (None, 8) 512 ['global\_average\_pooling2d\_1[0

][0]',

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

']

dropout\_2 (Dropout) (None, 1, 80, 16) 0 ['average\_pooling2d\_4[0][0]']

dense\_5 (Dense) (None, 64) 512 ['dense\_4[0][0]',

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

separable\_conv2d\_1 (Separa (None, 1, 80, 16) 512 ['dropout\_2[0][0]']

bleConv2D)

tf.\_\_operators\_\_.add\_1 (TF (None, 64) 0 ['dense\_5[0][0]',

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

batch\_normalization\_5 (Bat (None, 1, 80, 16) 64 ['separable\_conv2d\_1[0][0]']

chNormalization)

activation\_3 (Activation) (None, 64) 0 ['tf.\_\_operators\_\_.add\_1[0][0]

']

activation\_5 (Activation) (None, 1, 80, 16) 0 ['batch\_normalization\_5[0][0]'

]

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

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

average\_pooling2d\_5 (Avera (None, 1, 10, 16) 0 ['activation\_5[0][0]']

gePooling2D)

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

gePooling2D)

dropout\_3 (Dropout) (None, 1, 10, 16) 0 ['average\_pooling2d\_5[0][0]']

flatten\_2 (Flatten) (None, 1344) 0 ['average\_pooling2d\_3[0][0]']

flatten\_3 (Flatten) (None, 160) 0 ['dropout\_3[0][0]']

concatenate\_5 (Concatenate (None, 1504) 0 ['flatten\_2[0][0]',

) 'flatten\_3[0][0]']

dense\_6 (Dense) (None, 80) 120400 ['concatenate\_5[0][0]']

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

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Total params: 161509 (630.89 KB)

Trainable params: 161429 (630.58 KB)

Non-trainable params: 80 (320.00 Byte)

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

Epoch 1/10

353/353 - 62s - loss: 1.1991 - accuracy: 0.4670 - val\_loss: 1.0980 - val\_accuracy: 0.5294 - 62s/epoch - 177ms/step

Epoch 2/10

353/353 - 60s - loss: 1.0829 - accuracy: 0.5568 - val\_loss: 1.0591 - val\_accuracy: 0.5634 - 60s/epoch - 170ms/step

Epoch 3/10

353/353 - 60s - loss: 1.0558 - accuracy: 0.5701 - val\_loss: 1.0434 - val\_accuracy: 0.5656 - 60s/epoch - 170ms/step

Epoch 4/10

353/353 - 61s - loss: 1.0266 - accuracy: 0.5766 - val\_loss: 1.0458 - val\_accuracy: 0.5719 - 61s/epoch - 171ms/step

Epoch 5/10

353/353 - 60s - loss: 0.9965 - accuracy: 0.5944 - val\_loss: 1.0166 - val\_accuracy: 0.5755 - 60s/epoch - 170ms/step

Epoch 6/10

353/353 - 60s - loss: 0.9726 - accuracy: 0.6091 - val\_loss: 1.0006 - val\_accuracy: 0.5882 - 60s/epoch - 169ms/step

Epoch 7/10

353/353 - 60s - loss: 0.9367 - accuracy: 0.6206 - val\_loss: 0.9802 - val\_accuracy: 0.5946 - 60s/epoch - 170ms/step

Epoch 8/10

353/353 - 60s - loss: 0.9196 - accuracy: 0.6314 - val\_loss: 1.0067 - val\_accuracy: 0.6003 - 60s/epoch - 170ms/step

Epoch 9/10

353/353 - 60s - loss: 0.8856 - accuracy: 0.6530 - val\_loss: 0.9944 - val\_accuracy: 0.5854 - 60s/epoch - 169ms/step

Epoch 10/10

353/353 - 60s - loss: 0.8635 - accuracy: 0.6608 - val\_loss: 0.9933 - val\_accuracy: 0.6017 - 60s/epoch - 171ms/step

56/56 - 2s - loss: 1.0387 - accuracy: 0.5748 - 2s/epoch - 37ms/step

Test loss: 1.0386570692062378

Test accuracy: 0.5748299360275269

56/56 [==============================] - 2s 33ms/step

Model: "model\_2"

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

Layer (type) Output Shape Param # Connected to

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

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

conv2d\_10 (Conv2D) (None, 64, 321, 16) 496 ['input\_3[0][0]']

tf.math.reduce\_mean\_2 (TFO (None, 321, 16) 0 ['conv2d\_10[0][0]']

pLambda)

tf.math.reduce\_max\_2 (TFOp (None, 321, 16) 0 ['conv2d\_10[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\_6 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_4[0][0]',

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

conv2d\_14 (Conv2D) (None, 64, 321, 8) 640 ['input\_3[0][0]']

conv2d\_11 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_6[0][0]']

batch\_normalization\_6 (Bat (None, 64, 321, 8) 32 ['conv2d\_14[0][0]']

chNormalization)

multiply\_4 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_10[0][0]',

'conv2d\_11[0][0]']

depthwise\_conv2d\_5 (Depthw (None, 1, 321, 16) 1024 ['batch\_normalization\_6[0][0]'

iseConv2D) ]

depthwise\_conv2d\_4 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_10[0][0]']

iseConv2D)

conv2d\_12 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_4[0][0]']

conv2d\_13 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_10[0][0]']

batch\_normalization\_7 (Bat (None, 1, 321, 16) 64 ['depthwise\_conv2d\_5[0][0]']

chNormalization)

concatenate\_7 (Concatenate (None, 1, 321, 64) 0 ['depthwise\_conv2d\_4[0][0]',

) 'conv2d\_12[0][0]',

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

activation\_7 (Activation) (None, 1, 321, 16) 0 ['batch\_normalization\_7[0][0]'

]

global\_average\_pooling2d\_2 (None, 64) 0 ['concatenate\_7[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_2 (Gl (None, 64) 0 ['concatenate\_7[0][0]']

obalMaxPooling2D)

average\_pooling2d\_7 (Avera (None, 1, 80, 16) 0 ['activation\_7[0][0]']

gePooling2D)

dense\_8 (Dense) (None, 8) 512 ['global\_average\_pooling2d\_2[0

][0]',

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

']

dropout\_4 (Dropout) (None, 1, 80, 16) 0 ['average\_pooling2d\_7[0][0]']

dense\_9 (Dense) (None, 64) 512 ['dense\_8[0][0]',

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

separable\_conv2d\_2 (Separa (None, 1, 80, 16) 512 ['dropout\_4[0][0]']

bleConv2D)

tf.\_\_operators\_\_.add\_2 (TF (None, 64) 0 ['dense\_9[0][0]',

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

batch\_normalization\_8 (Bat (None, 1, 80, 16) 64 ['separable\_conv2d\_2[0][0]']

chNormalization)

activation\_6 (Activation) (None, 64) 0 ['tf.\_\_operators\_\_.add\_2[0][0]

']

activation\_8 (Activation) (None, 1, 80, 16) 0 ['batch\_normalization\_8[0][0]'

]

multiply\_5 (Multiply) (None, 1, 321, 64) 0 ['concatenate\_7[0][0]',

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

average\_pooling2d\_8 (Avera (None, 1, 10, 16) 0 ['activation\_8[0][0]']

gePooling2D)

average\_pooling2d\_6 (Avera (None, 1, 21, 64) 0 ['multiply\_5[0][0]']

gePooling2D)

dropout\_5 (Dropout) (None, 1, 10, 16) 0 ['average\_pooling2d\_8[0][0]']

flatten\_4 (Flatten) (None, 1344) 0 ['average\_pooling2d\_6[0][0]']

flatten\_5 (Flatten) (None, 160) 0 ['dropout\_5[0][0]']

concatenate\_8 (Concatenate (None, 1504) 0 ['flatten\_4[0][0]',

) 'flatten\_5[0][0]']

dense\_10 (Dense) (None, 80) 120400 ['concatenate\_8[0][0]']

dense\_11 (Dense) (None, 4) 324 ['dense\_10[0][0]']

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

Total params: 161509 (630.89 KB)

Trainable params: 161429 (630.58 KB)

Non-trainable params: 80 (320.00 Byte)

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

Epoch 1/10

353/353 - 62s - loss: 1.2081 - accuracy: 0.4508 - val\_loss: 1.1434 - val\_accuracy: 0.5237 - 62s/epoch - 176ms/step

Epoch 2/10

353/353 - 60s - loss: 1.0989 - accuracy: 0.5378 - val\_loss: 1.1011 - val\_accuracy: 0.5429 - 60s/epoch - 169ms/step

Epoch 3/10

353/353 - 60s - loss: 1.0710 - accuracy: 0.5501 - val\_loss: 1.0651 - val\_accuracy: 0.5641 - 60s/epoch - 170ms/step

Epoch 4/10

353/353 - 60s - loss: 1.0493 - accuracy: 0.5676 - val\_loss: 1.0593 - val\_accuracy: 0.5684 - 60s/epoch - 170ms/step

Epoch 5/10

353/353 - 60s - loss: 1.0337 - accuracy: 0.5786 - val\_loss: 1.0456 - val\_accuracy: 0.5726 - 60s/epoch - 170ms/step

Epoch 6/10

353/353 - 60s - loss: 1.0146 - accuracy: 0.5915 - val\_loss: 1.0413 - val\_accuracy: 0.5811 - 60s/epoch - 169ms/step

Epoch 7/10

353/353 - 60s - loss: 0.9933 - accuracy: 0.5995 - val\_loss: 1.0173 - val\_accuracy: 0.5904 - 60s/epoch - 170ms/step

Epoch 8/10

353/353 - 60s - loss: 0.9764 - accuracy: 0.6006 - val\_loss: 1.0190 - val\_accuracy: 0.5889 - 60s/epoch - 170ms/step

Epoch 9/10

353/353 - 60s - loss: 0.9617 - accuracy: 0.6142 - val\_loss: 1.0197 - val\_accuracy: 0.6010 - 60s/epoch - 170ms/step

Epoch 10/10

353/353 - 60s - loss: 0.9495 - accuracy: 0.6215 - val\_loss: 1.0365 - val\_accuracy: 0.5911 - 60s/epoch - 170ms/step

56/56 - 2s - loss: 0.9734 - accuracy: 0.6105 - 2s/epoch - 30ms/step

Test loss: 0.9733642339706421

Test accuracy: 0.6105442047119141

56/56 [==============================] - 2s 31ms/step

Model: "model\_3"

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

Layer (type) Output Shape Param # Connected to

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

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

conv2d\_15 (Conv2D) (None, 64, 321, 16) 496 ['input\_4[0][0]']

tf.math.reduce\_mean\_3 (TFO (None, 321, 16) 0 ['conv2d\_15[0][0]']

pLambda)

tf.math.reduce\_max\_3 (TFOp (None, 321, 16) 0 ['conv2d\_15[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\_9 (Concatenate (None, 1, 321, 32) 0 ['tf.expand\_dims\_6[0][0]',

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

conv2d\_19 (Conv2D) (None, 64, 321, 8) 640 ['input\_4[0][0]']

conv2d\_16 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_9[0][0]']

batch\_normalization\_9 (Bat (None, 64, 321, 8) 32 ['conv2d\_19[0][0]']

chNormalization)

multiply\_6 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_15[0][0]',

'conv2d\_16[0][0]']

depthwise\_conv2d\_7 (Depthw (None, 1, 321, 16) 1024 ['batch\_normalization\_9[0][0]'

iseConv2D) ]

depthwise\_conv2d\_6 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_15[0][0]']

iseConv2D)

conv2d\_17 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_6[0][0]']

conv2d\_18 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_15[0][0]']

batch\_normalization\_10 (Ba (None, 1, 321, 16) 64 ['depthwise\_conv2d\_7[0][0]']

tchNormalization)

concatenate\_10 (Concatenat (None, 1, 321, 64) 0 ['depthwise\_conv2d\_6[0][0]',

e) 'conv2d\_17[0][0]',

'conv2d\_18[0][0]']

activation\_10 (Activation) (None, 1, 321, 16) 0 ['batch\_normalization\_10[0][0]

']

global\_average\_pooling2d\_3 (None, 64) 0 ['concatenate\_10[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_3 (Gl (None, 64) 0 ['concatenate\_10[0][0]']

obalMaxPooling2D)

average\_pooling2d\_10 (Aver (None, 1, 80, 16) 0 ['activation\_10[0][0]']

agePooling2D)

dense\_12 (Dense) (None, 8) 512 ['global\_average\_pooling2d\_3[0

][0]',

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

']

dropout\_6 (Dropout) (None, 1, 80, 16) 0 ['average\_pooling2d\_10[0][0]']

dense\_13 (Dense) (None, 64) 512 ['dense\_12[0][0]',

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

separable\_conv2d\_3 (Separa (None, 1, 80, 16) 512 ['dropout\_6[0][0]']

bleConv2D)

tf.\_\_operators\_\_.add\_3 (TF (None, 64) 0 ['dense\_13[0][0]',

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

batch\_normalization\_11 (Ba (None, 1, 80, 16) 64 ['separable\_conv2d\_3[0][0]']

tchNormalization)

activation\_9 (Activation) (None, 64) 0 ['tf.\_\_operators\_\_.add\_3[0][0]

']

activation\_11 (Activation) (None, 1, 80, 16) 0 ['batch\_normalization\_11[0][0]

']

multiply\_7 (Multiply) (None, 1, 321, 64) 0 ['concatenate\_10[0][0]',

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

average\_pooling2d\_11 (Aver (None, 1, 10, 16) 0 ['activation\_11[0][0]']

agePooling2D)

average\_pooling2d\_9 (Avera (None, 1, 21, 64) 0 ['multiply\_7[0][0]']

gePooling2D)

dropout\_7 (Dropout) (None, 1, 10, 16) 0 ['average\_pooling2d\_11[0][0]']

flatten\_6 (Flatten) (None, 1344) 0 ['average\_pooling2d\_9[0][0]']

flatten\_7 (Flatten) (None, 160) 0 ['dropout\_7[0][0]']

concatenate\_11 (Concatenat (None, 1504) 0 ['flatten\_6[0][0]',

e) 'flatten\_7[0][0]']

dense\_14 (Dense) (None, 80) 120400 ['concatenate\_11[0][0]']

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

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Total params: 161509 (630.89 KB)

Trainable params: 161429 (630.58 KB)

Non-trainable params: 80 (320.00 Byte)

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Epoch 1/10

353/353 - 62s - loss: 1.1874 - accuracy: 0.4636 - val\_loss: 1.0970 - val\_accuracy: 0.5408 - 62s/epoch - 176ms/step

Epoch 2/10

353/353 - 60s - loss: 1.0596 - accuracy: 0.5582 - val\_loss: 1.0534 - val\_accuracy: 0.5726 - 60s/epoch - 170ms/step

Epoch 3/10

353/353 - 60s - loss: 1.0122 - accuracy: 0.5866 - val\_loss: 1.0390 - val\_accuracy: 0.5783 - 60s/epoch - 170ms/step

Epoch 4/10

353/353 - 60s - loss: 0.9922 - accuracy: 0.5993 - val\_loss: 1.0367 - val\_accuracy: 0.5734 - 60s/epoch - 169ms/step

Epoch 5/10

353/353 - 60s - loss: 0.9736 - accuracy: 0.6029 - val\_loss: 0.9974 - val\_accuracy: 0.5925 - 60s/epoch - 170ms/step

Epoch 6/10

353/353 - 60s - loss: 0.9385 - accuracy: 0.6222 - val\_loss: 0.9752 - val\_accuracy: 0.6095 - 60s/epoch - 170ms/step

Epoch 7/10

353/353 - 60s - loss: 0.9065 - accuracy: 0.6342 - val\_loss: 0.9757 - val\_accuracy: 0.6067 - 60s/epoch - 170ms/step

Epoch 8/10

353/353 - 60s - loss: 0.8844 - accuracy: 0.6433 - val\_loss: 0.9990 - val\_accuracy: 0.6052 - 60s/epoch - 170ms/step

Epoch 9/10

353/353 - 60s - loss: 0.8575 - accuracy: 0.6504 - val\_loss: 0.9644 - val\_accuracy: 0.6300 - 60s/epoch - 170ms/step

Epoch 10/10

353/353 - 60s - loss: 0.8294 - accuracy: 0.6725 - val\_loss: 0.9973 - val\_accuracy: 0.5953 - 60s/epoch - 169ms/step

56/56 - 2s - loss: 1.1392 - accuracy: 0.5499 - 2s/epoch - 31ms/step

Test loss: 1.1391621828079224

Test accuracy: 0.5498866438865662

56/56 [==============================] - 2s 31ms/step

Model: "model\_4"

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

Layer (type) Output Shape Param # Connected to

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

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

conv2d\_20 (Conv2D) (None, 64, 321, 16) 496 ['input\_5[0][0]']

tf.math.reduce\_mean\_4 (TFO (None, 321, 16) 0 ['conv2d\_20[0][0]']

pLambda)

tf.math.reduce\_max\_4 (TFOp (None, 321, 16) 0 ['conv2d\_20[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\_12 (Concatenat (None, 1, 321, 32) 0 ['tf.expand\_dims\_8[0][0]',

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

conv2d\_24 (Conv2D) (None, 64, 321, 8) 640 ['input\_5[0][0]']

conv2d\_21 (Conv2D) (None, 1, 321, 1) 2049 ['concatenate\_12[0][0]']

batch\_normalization\_12 (Ba (None, 64, 321, 8) 32 ['conv2d\_24[0][0]']

tchNormalization)

multiply\_8 (Multiply) (None, 64, 321, 16) 0 ['conv2d\_20[0][0]',

'conv2d\_21[0][0]']

depthwise\_conv2d\_9 (Depthw (None, 1, 321, 16) 1024 ['batch\_normalization\_12[0][0]

iseConv2D) ']

depthwise\_conv2d\_8 (Depthw (None, 1, 321, 32) 2080 ['conv2d\_20[0][0]']

iseConv2D)

conv2d\_22 (Conv2D) (None, 1, 321, 16) 16400 ['multiply\_8[0][0]']

conv2d\_23 (Conv2D) (None, 1, 321, 16) 16400 ['conv2d\_20[0][0]']

batch\_normalization\_13 (Ba (None, 1, 321, 16) 64 ['depthwise\_conv2d\_9[0][0]']

tchNormalization)

concatenate\_13 (Concatenat (None, 1, 321, 64) 0 ['depthwise\_conv2d\_8[0][0]',

e) 'conv2d\_22[0][0]',

'conv2d\_23[0][0]']

activation\_13 (Activation) (None, 1, 321, 16) 0 ['batch\_normalization\_13[0][0]

']

global\_average\_pooling2d\_4 (None, 64) 0 ['concatenate\_13[0][0]']

(GlobalAveragePooling2D)

global\_max\_pooling2d\_4 (Gl (None, 64) 0 ['concatenate\_13[0][0]']

obalMaxPooling2D)

average\_pooling2d\_13 (Aver (None, 1, 80, 16) 0 ['activation\_13[0][0]']

agePooling2D)

dense\_16 (Dense) (None, 8) 512 ['global\_average\_pooling2d\_4[0

][0]',

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

']

dropout\_8 (Dropout) (None, 1, 80, 16) 0 ['average\_pooling2d\_13[0][0]']

dense\_17 (Dense) (None, 64) 512 ['dense\_16[0][0]',

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

separable\_conv2d\_4 (Separa (None, 1, 80, 16) 512 ['dropout\_8[0][0]']

bleConv2D)

tf.\_\_operators\_\_.add\_4 (TF (None, 64) 0 ['dense\_17[0][0]',

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

batch\_normalization\_14 (Ba (None, 1, 80, 16) 64 ['separable\_conv2d\_4[0][0]']

tchNormalization)

activation\_12 (Activation) (None, 64) 0 ['tf.\_\_operators\_\_.add\_4[0][0]

']

activation\_14 (Activation) (None, 1, 80, 16) 0 ['batch\_normalization\_14[0][0]

']

multiply\_9 (Multiply) (None, 1, 321, 64) 0 ['concatenate\_13[0][0]',

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

average\_pooling2d\_14 (Aver (None, 1, 10, 16) 0 ['activation\_14[0][0]']

agePooling2D)

average\_pooling2d\_12 (Aver (None, 1, 21, 64) 0 ['multiply\_9[0][0]']

agePooling2D)

dropout\_9 (Dropout) (None, 1, 10, 16) 0 ['average\_pooling2d\_14[0][0]']

flatten\_8 (Flatten) (None, 1344) 0 ['average\_pooling2d\_12[0][0]']

flatten\_9 (Flatten) (None, 160) 0 ['dropout\_9[0][0]']

concatenate\_14 (Concatenat (None, 1504) 0 ['flatten\_8[0][0]',

e) 'flatten\_9[0][0]']

dense\_18 (Dense) (None, 80) 120400 ['concatenate\_14[0][0]']

dense\_19 (Dense) (None, 4) 324 ['dense\_18[0][0]']

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Total params: 161509 (630.89 KB)

Trainable params: 161429 (630.58 KB)

Non-trainable params: 80 (320.00 Byte)

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

Epoch 1/10

353/353 - 63s - loss: 1.2208 - accuracy: 0.4424 - val\_loss: 1.1472 - val\_accuracy: 0.5135 - 63s/epoch - 177ms/step

Epoch 2/10

353/353 - 60s - loss: 1.0960 - accuracy: 0.5409 - val\_loss: 1.0926 - val\_accuracy: 0.5574 - 60s/epoch - 170ms/step

Epoch 3/10

353/353 - 60s - loss: 1.0472 - accuracy: 0.5673 - val\_loss: 1.0739 - val\_accuracy: 0.5694 - 60s/epoch - 170ms/step

Epoch 4/10

353/353 - 60s - loss: 1.0207 - accuracy: 0.5822 - val\_loss: 1.0240 - val\_accuracy: 0.5807 - 60s/epoch - 170ms/step

Epoch 5/10

353/353 - 60s - loss: 0.9864 - accuracy: 0.5955 - val\_loss: 1.0232 - val\_accuracy: 0.5772 - 60s/epoch - 170ms/step

Epoch 6/10

353/353 - 60s - loss: 0.9563 - accuracy: 0.6102 - val\_loss: 1.0052 - val\_accuracy: 0.5963 - 60s/epoch - 170ms/step

Epoch 7/10

353/353 - 60s - loss: 0.9378 - accuracy: 0.6214 - val\_loss: 0.9985 - val\_accuracy: 0.5921 - 60s/epoch - 170ms/step

Epoch 8/10

353/353 - 60s - loss: 0.9199 - accuracy: 0.6318 - val\_loss: 1.0099 - val\_accuracy: 0.5928 - 60s/epoch - 170ms/step

Epoch 9/10

353/353 - 60s - loss: 0.9020 - accuracy: 0.6417 - val\_loss: 1.0088 - val\_accuracy: 0.6105 - 60s/epoch - 171ms/step

Epoch 10/10

353/353 - 60s - loss: 0.8813 - accuracy: 0.6479 - val\_loss: 1.0023 - val\_accuracy: 0.6048 - 60s/epoch - 169ms/step

56/56 - 2s - loss: 0.9765 - accuracy: 0.6056 - 2s/epoch - 33ms/step

Test loss: 0.9765225052833557

Test accuracy: 0.6055618524551392

56/56 [==============================] - 2s 31ms/step

Mean loss: 1.018039345741272

Mean accuracy: 0.5906135082244873