*# model*

classifier = Sequential()

*# adding layers*

classifier.add(Conv2D(32, *kernel\_size*=3, *strides*=1, *padding*="same", *kernel\_regularizer*=regularizers.l2(0.00001), *input\_shape*=(128, 128, 3)))

classifier.add(LeakyReLU())

classifier.add(Conv2D(32, *kernel\_size*=3, *strides*=1, *padding*="same", *kernel\_regularizer*=regularizers.l2(0.00001)))

classifier.add(LeakyReLU())

classifier.add(Conv2D(32, *kernel\_size*=3, *strides*=1, *padding*="same", *kernel\_regularizer*=regularizers.l2(0.00001)))

classifier.add(LeakyReLU())

classifier.add(MaxPooling2D(*pool\_size*=(2, 2)))

classifier.add(Dropout(0.6))

classifier.add(Conv2D(32, *kernel\_size*=3, *strides*=1, *padding*="same"))

classifier.add(LeakyReLU())

classifier.add(Conv2D(32, *kernel\_size*=3, *strides*=1, *padding*="same",))

classifier.add(LeakyReLU())

classifier.add(Conv2D(32, *kernel\_size*=3, *strides*=1, *padding*="same",))

classifier.add(LeakyReLU())

classifier.add(MaxPooling2D(*pool\_size*=(2, 2)))

classifier.add(DepthwiseConv2D( *kernel\_size*=3, *strides*=1, *padding*="same",*kernel\_initializer*='he\_normal'))

classifier.add(LeakyReLU())

classifier.add(BatchNormalization(*axis*=3))

classifier.add(Conv2D(32, *kernel\_size*=1, *strides*=1, *padding*="same",*kernel\_initializer*='he\_normal'))

classifier.add(LeakyReLU())

classifier.add(BatchNormalization(*axis*=3))

classifier.add(DepthwiseConv2D( *kernel\_size*=3, *strides*=1, *padding*="same",*kernel\_initializer*='he\_normal'))

classifier.add(LeakyReLU())

classifier.add(BatchNormalization(*axis*=3))

classifier.add(Conv2D(32, *kernel\_size*=1, *strides*=1, *padding*="same",*kernel\_initializer*='he\_normal'))

classifier.add(LeakyReLU())

classifier.add(BatchNormalization(*axis*=3))

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same"))

classifier.add(LeakyReLU())

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same"))

classifier.add(LeakyReLU())

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same",))

classifier.add(LeakyReLU())

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same",))

classifier.add(LeakyReLU())

classifier.add(MaxPooling2D(*pool\_size*=(2, 2)))

classifier.add(Dropout(0.6))

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same"))

classifier.add(LeakyReLU())

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same"))

classifier.add(LeakyReLU())

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same",))

classifier.add(LeakyReLU())

classifier.add(Conv2D(64, *kernel\_size*=3, *strides*=1, *padding*="same",))

classifier.add(LeakyReLU())

*# classifier.add(GlobalAveragePooling2D())*

classifier.add(MaxPooling2D(*pool\_size*=(2, 2)))

classifier.add(Flatten())

classifier.add(Dropout(0.4))

classifier.add(Dense(1024, *activation*='relu'))

classifier.add(Dropout(0.4))

classifier.add(Dense(512, *activation*='relu'))

classifier.add(Dropout(0.4))

classifier.add(Dense(256, *activation*='relu'))

classifier.add(Dropout(0.4))

classifier.add(Dense(128, *activation*='relu'))

classifier.add(Dense(*units*=24, *activation*='softmax'))

*# compiling cnn*

classifier.compile(*optimizer*='adam',

*loss*='categorical\_crossentropy',

*metrics*=['accuracy']

)

(keras) G:\asl a dataset\combo>python test-1.py

Using TensorFlow backend.

2018-12-07 17:37:10.569173: I tensorflow/core/platform/cpu\_feature\_guard.cc:141] Your CPU supports instructions that this TensorFlow binary was not compiled to use: AVX2

2018-12-07 17:37:11.174109: I tensorflow/core/common\_runtime/gpu/gpu\_device.cc:1411] Found device 0 with properties:

name: GeForce GTX 1050 major: 6 minor: 1 memoryClockRate(GHz): 1.455

pciBusID: 0000:09:00.0

totalMemory: 2.00GiB freeMemory: 1.60GiB

2018-12-07 17:37:11.185837: I tensorflow/core/common\_runtime/gpu/gpu\_device.cc:1490] Adding visible gpu devices: 0

2018-12-07 17:37:13.229233: I tensorflow/core/common\_runtime/gpu/gpu\_device.cc:971] Device interconnect StreamExecutor with strength 1 edge matrix:

2018-12-07 17:37:13.233971: I tensorflow/core/common\_runtime/gpu/gpu\_device.cc:977] 0

2018-12-07 17:37:13.238682: I tensorflow/core/common\_runtime/gpu/gpu\_device.cc:990] 0: N

2018-12-07 17:37:13.242829: I tensorflow/core/common\_runtime/gpu/gpu\_device.cc:1103] Created TensorFlow device (/job:localhost/replica:0/task:0/device:GPU:0 with 1351 MB memory) -> physical GPU (device: 0, name: GeForce GTX 1050, pci bus id: 0000:09:00.0, compute capability: 6.1)

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Layer (type) Output Shape Param #

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conv2d\_1 (Conv2D) (None, 128, 128, 32) 896

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leaky\_re\_lu\_1 (LeakyReLU) (None, 128, 128, 32) 0

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conv2d\_2 (Conv2D) (None, 128, 128, 32) 9248

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leaky\_re\_lu\_2 (LeakyReLU) (None, 128, 128, 32) 0

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conv2d\_3 (Conv2D) (None, 128, 128, 32) 9248

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leaky\_re\_lu\_3 (LeakyReLU) (None, 128, 128, 32) 0

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max\_pooling2d\_1 (MaxPooling2 (None, 64, 64, 32) 0

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dropout\_1 (Dropout) (None, 64, 64, 32) 0

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conv2d\_4 (Conv2D) (None, 64, 64, 32) 9248

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leaky\_re\_lu\_4 (LeakyReLU) (None, 64, 64, 32) 0

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conv2d\_5 (Conv2D) (None, 64, 64, 32) 9248

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leaky\_re\_lu\_5 (LeakyReLU) (None, 64, 64, 32) 0

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conv2d\_6 (Conv2D) (None, 64, 64, 32) 9248

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leaky\_re\_lu\_6 (LeakyReLU) (None, 64, 64, 32) 0

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max\_pooling2d\_2 (MaxPooling2 (None, 32, 32, 32) 0

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depthwise\_conv2d\_1 (Depthwis (None, 32, 32, 32) 320

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leaky\_re\_lu\_7 (LeakyReLU) (None, 32, 32, 32) 0

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batch\_normalization\_1 (Batch (None, 32, 32, 32) 128

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conv2d\_7 (Conv2D) (None, 32, 32, 32) 1056

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leaky\_re\_lu\_8 (LeakyReLU) (None, 32, 32, 32) 0

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batch\_normalization\_2 (Batch (None, 32, 32, 32) 128

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depthwise\_conv2d\_2 (Depthwis (None, 32, 32, 32) 320

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leaky\_re\_lu\_9 (LeakyReLU) (None, 32, 32, 32) 0

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batch\_normalization\_3 (Batch (None, 32, 32, 32) 128

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conv2d\_8 (Conv2D) (None, 32, 32, 32) 1056

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leaky\_re\_lu\_10 (LeakyReLU) (None, 32, 32, 32) 0

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batch\_normalization\_4 (Batch (None, 32, 32, 32) 128

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conv2d\_9 (Conv2D) (None, 32, 32, 64) 18496

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leaky\_re\_lu\_11 (LeakyReLU) (None, 32, 32, 64) 0

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conv2d\_10 (Conv2D) (None, 32, 32, 64) 36928

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leaky\_re\_lu\_12 (LeakyReLU) (None, 32, 32, 64) 0

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conv2d\_11 (Conv2D) (None, 32, 32, 64) 36928

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leaky\_re\_lu\_13 (LeakyReLU) (None, 32, 32, 64) 0

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conv2d\_12 (Conv2D) (None, 32, 32, 64) 36928

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leaky\_re\_lu\_14 (LeakyReLU) (None, 32, 32, 64) 0

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max\_pooling2d\_3 (MaxPooling2 (None, 16, 16, 64) 0

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dropout\_2 (Dropout) (None, 16, 16, 64) 0

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conv2d\_13 (Conv2D) (None, 16, 16, 64) 36928

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leaky\_re\_lu\_15 (LeakyReLU) (None, 16, 16, 64) 0

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conv2d\_14 (Conv2D) (None, 16, 16, 64) 36928

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leaky\_re\_lu\_16 (LeakyReLU) (None, 16, 16, 64) 0

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conv2d\_15 (Conv2D) (None, 16, 16, 64) 36928

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leaky\_re\_lu\_17 (LeakyReLU) (None, 16, 16, 64) 0

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conv2d\_16 (Conv2D) (None, 16, 16, 64) 36928

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leaky\_re\_lu\_18 (LeakyReLU) (None, 16, 16, 64) 0

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max\_pooling2d\_4 (MaxPooling2 (None, 8, 8, 64) 0

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flatten\_1 (Flatten) (None, 4096) 0

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dropout\_3 (Dropout) (None, 4096) 0

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dense\_1 (Dense) (None, 1024) 4195328

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dropout\_4 (Dropout) (None, 1024) 0

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dense\_2 (Dense) (None, 512) 524800

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dropout\_5 (Dropout) (None, 512) 0

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dense\_3 (Dense) (None, 256) 131328

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dropout\_6 (Dropout) (None, 256) 0

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dense\_4 (Dense) (None, 128) 32896

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dense\_5 (Dense) (None, 24) 3096

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Total params: 5,214,840

Trainable params: 5,214,584

Non-trainable params: 256

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Found 53142 images belonging to 24 classes.

Found 52938 images belonging to 24 classes.

Epoch 1/50

2018-12-07 17:37:31.816564: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 1.01GiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

2018-12-07 17:37:31.937510: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 1.13GiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

2018-12-07 17:37:31.946236: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 1.51GiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

2018-12-07 17:37:32.494902: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 552.00MiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

2018-12-07 17:37:32.696415: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 2.14GiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

2018-12-07 17:37:32.878972: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 1.51GiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

2018-12-07 17:37:33.045366: W tensorflow/core/common\_runtime/bfc\_allocator.cc:215] Allocator (GPU\_0\_bfc) ran out of memory trying to allocate 1.23GiB. The caller indicates that this is not a failure, but may mean that there could be performance gains if more memory were available.

830/830 [==============================] - 1655s 2s/step - loss: 2.7579 - acc: 0.1557 - val\_loss: 2.2342 - val\_acc: 0.3041

Epoch 2/50

830/830 [==============================] - 396s 477ms/step - loss: 1.8961 - acc: 0.3866 - val\_loss: 1.8766 - val\_acc: 0.4184

Epoch 3/50

830/830 [==============================] - 396s 477ms/step - loss: 1.5571 - acc: 0.4947 - val\_loss: 1.7413 - val\_acc: 0.4884

Epoch 4/50

830/830 [==============================] - 396s 477ms/step - loss: 1.3678 - acc: 0.5589 - val\_loss: 1.5984 - val\_acc: 0.5444

Epoch 5/50

830/830 [==============================] - 396s 477ms/step - loss: 1.2472 - acc: 0.6029 - val\_loss: 1.4833 - val\_acc: 0.5561

Epoch 6/50

830/830 [==============================] - 399s 481ms/step - loss: 1.1461 - acc: 0.6366 - val\_loss: 1.5066 - val\_acc: 0.5518

Epoch 7/50

830/830 [==============================] - 396s 478ms/step - loss: 1.0909 - acc: 0.6575 - val\_loss: 1.4771 - val\_acc: 0.5685

Epoch 8/50

830/830 [==============================] - 397s 478ms/step - loss: 1.0325 - acc: 0.6773 - val\_loss: 1.6504 - val\_acc: 0.5474

Epoch 9/50

830/830 [==============================] - 403s 485ms/step - loss: 0.9822 - acc: 0.6938 - val\_loss: 1.4554 - val\_acc: 0.5774

Epoch 10/50

830/830 [==============================] - 404s 487ms/step - loss: 0.9500 - acc: 0.7057 - val\_loss: 1.4575 - val\_acc: 0.5784

Epoch 11/50

830/830 [==============================] - 397s 478ms/step - loss: 0.9231 - acc: 0.7175 - val\_loss: 1.4147 - val\_acc: 0.6005

Epoch 12/50

830/830 [==============================] - 397s 478ms/step - loss: 0.8767 - acc: 0.7339 - val\_loss: 1.5783 - val\_acc: 0.5962

Epoch 13/50

830/830 [==============================] - 397s 478ms/step - loss: 0.8711 - acc: 0.7354 - val\_loss: 1.3884 - val\_acc: 0.5990

Epoch 14/50

830/830 [==============================] - 397s 478ms/step - loss: 0.8367 - acc: 0.7457 - val\_loss: 1.4998 - val\_acc: 0.5940

Epoch 15/50

830/830 [==============================] - 397s 478ms/step - loss: 0.8165 - acc: 0.7530 - val\_loss: 1.4368 - val\_acc: 0.6048

Epoch 16/50

830/830 [==============================] - 397s 478ms/step - loss: 0.8078 - acc: 0.7568 - val\_loss: 1.5864 - val\_acc: 0.5690

Epoch 17/50

830/830 [==============================] - 397s 478ms/step - loss: 0.8038 - acc: 0.7566 - val\_loss: 1.4203 - val\_acc: 0.5993

Epoch 18/50

830/830 [==============================] - 398s 480ms/step - loss: 0.7709 - acc: 0.7674 - val\_loss: 1.3234 - val\_acc: 0.6387

Epoch 19/50

830/830 [==============================] - 404s 486ms/step - loss: 0.7551 - acc: 0.7759 - val\_loss: 1.3953 - val\_acc: 0.5974

Epoch 20/50

830/830 [==============================] - 404s 487ms/step - loss: 0.7658 - acc: 0.7713 - val\_loss: 1.4318 - val\_acc: 0.6060

Epoch 21/50

830/830 [==============================] - 396s 478ms/step - loss: 0.7466 - acc: 0.7790 - val\_loss: 1.3598 - val\_acc: 0.6210

Epoch 22/50

830/830 [==============================] - 396s 478ms/step - loss: 0.7406 - acc: 0.7795 - val\_loss: 1.4084 - val\_acc: 0.6138

Epoch 00022: ReduceLROnPlateau reducing learning rate to 0.00020000000949949026.

Epoch 23/50

830/830 [==============================] - 396s 478ms/step - loss: 0.5944 - acc: 0.8204 - val\_loss: 1.3001 - val\_acc: 0.6516

Epoch 24/50

830/830 [==============================] - 397s 478ms/step - loss: 0.5529 - acc: 0.8321 - val\_loss: 1.3613 - val\_acc: 0.6447

Epoch 25/50

830/830 [==============================] - 397s 478ms/step - loss: 0.5213 - acc: 0.8406 - val\_loss: 1.3409 - val\_acc: 0.6561

Epoch 26/50

830/830 [==============================] - 397s 478ms/step - loss: 0.5103 - acc: 0.8435 - val\_loss: 1.3446 - val\_acc: 0.6643

Epoch 27/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4919 - acc: 0.8501 - val\_loss: 1.3439 - val\_acc: 0.6622

Epoch 28/50

830/830 [==============================] - 399s 481ms/step - loss: 0.4911 - acc: 0.8488 - val\_loss: 1.3488 - val\_acc: 0.6563

Epoch 29/50

830/830 [==============================] - 405s 487ms/step - loss: 0.4779 - acc: 0.8515 - val\_loss: 1.3232 - val\_acc: 0.6551

Epoch 30/50

830/830 [==============================] - 402s 485ms/step - loss: 0.4790 - acc: 0.8541 - val\_loss: 1.3455 - val\_acc: 0.6564

Epoch 00030: ReduceLROnPlateau reducing learning rate to 4.0000001899898055e-05.

Epoch 31/50

830/830 [==============================] - 397s 479ms/step - loss: 0.4529 - acc: 0.8627 - val\_loss: 1.3427 - val\_acc: 0.6624

Epoch 32/50

830/830 [==============================] - 397s 479ms/step - loss: 0.4436 - acc: 0.8616 - val\_loss: 1.3325 - val\_acc: 0.6637

Epoch 33/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4427 - acc: 0.8618 - val\_loss: 1.3253 - val\_acc: 0.6625

Epoch 34/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4356 - acc: 0.8640 - val\_loss: 1.3445 - val\_acc: 0.6658

Epoch 35/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4376 - acc: 0.8654 - val\_loss: 1.3338 - val\_acc: 0.6679

Epoch 36/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4271 - acc: 0.8664 - val\_loss: 1.3779 - val\_acc: 0.6619

Epoch 37/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4216 - acc: 0.8689 - val\_loss: 1.3614 - val\_acc: 0.6652

Epoch 38/50

830/830 [==============================] - 399s 481ms/step - loss: 0.4251 - acc: 0.8680 - val\_loss: 1.3442 - val\_acc: 0.6634

Epoch 39/50

830/830 [==============================] - 404s 486ms/step - loss: 0.4159 - acc: 0.8703 - val\_loss: 1.3755 - val\_acc: 0.6646

Epoch 00039: ReduceLROnPlateau reducing learning rate to 8.000000525498762e-06.

Epoch 40/50

830/830 [==============================] - 400s 481ms/step - loss: 0.4163 - acc: 0.8708 - val\_loss: 1.3635 - val\_acc: 0.6663

Epoch 41/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4165 - acc: 0.8712 - val\_loss: 1.3549 - val\_acc: 0.6665

Epoch 42/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4183 - acc: 0.8714 - val\_loss: 1.3568 - val\_acc: 0.6657

Epoch 43/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4151 - acc: 0.8720 - val\_loss: 1.3588 - val\_acc: 0.6659

Epoch 00043: ReduceLROnPlateau reducing learning rate to 1.6000001778593287e-06.

Epoch 44/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4186 - acc: 0.8719 - val\_loss: 1.3598 - val\_acc: 0.6665

Epoch 45/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4159 - acc: 0.8711 - val\_loss: 1.3590 - val\_acc: 0.6675

Epoch 46/50

830/830 [==============================] - 397s 478ms/step - loss: 0.4113 - acc: 0.8721 - val\_loss: 1.3532 - val\_acc: 0.6673

Epoch 47/50

830/830 [==============================] - 398s 479ms/step - loss: 0.4076 - acc: 0.8732 - val\_loss: 1.3526 - val\_acc: 0.6671

Epoch 00047: ReduceLROnPlateau reducing learning rate to 3.200000264769187e-07.

Epoch 48/50

830/830 [==============================] - 401s 483ms/step - loss: 0.4168 - acc: 0.8717 - val\_loss: 1.3528 - val\_acc: 0.6667

Epoch 49/50

830/830 [==============================] - 401s 484ms/step - loss: 0.4106 - acc: 0.8707 - val\_loss: 1.3501 - val\_acc: 0.6681

Epoch 50/50

830/830 [==============================] - 398s 479ms/step - loss: 0.4103 - acc: 0.8710 - val\_loss: 1.3544 - val\_acc: 0.6666