Model Exploration

ResNet50

Class Column	# of Classes	Batch size	Data augmentation	Learning rate	Link
masterCategory	4	32	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-01
masterCategory	4	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-02
masterCategory	4	5	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-03
masterCategory	4	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-04

masterCategory	4	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-05
masterCategory	4	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-06
gender	5	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-07
baseColour	11	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	Result-07

Accuracy and results-01

Model description

- ResNet50 - 4 upper layers are trainable
- Dropout 0.2
- Flatten
- Dense-512
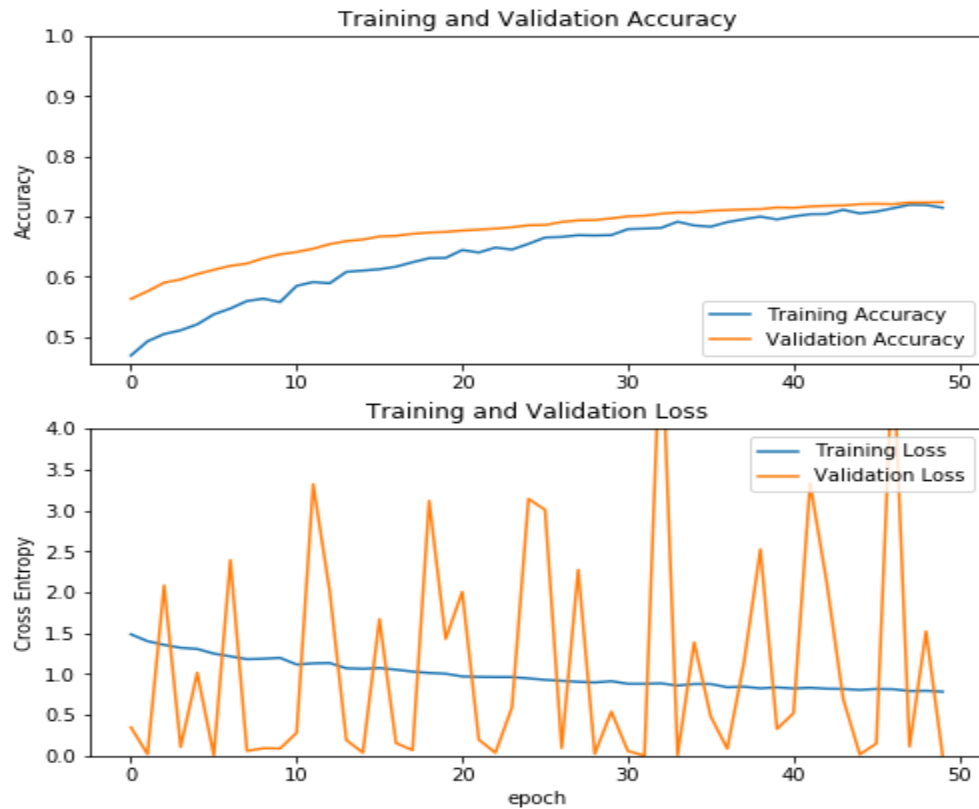- Dropout 0.2
- Dense-512 (prediction)

Fig-01: ResNet50 model training and validation history for batch size-32

Train accuracy - 71%

Train loss - 0.7822

Validation accuracy - 72%

Validation loss - 1.10 (Avg)

Test accuracy - **71%**

Accuracy and results-02

Model description

- ResNet50 - 4 upper layers are trainable
- Dropout 0.2
- Flatten
- Dense-512
- Dropout 0.2
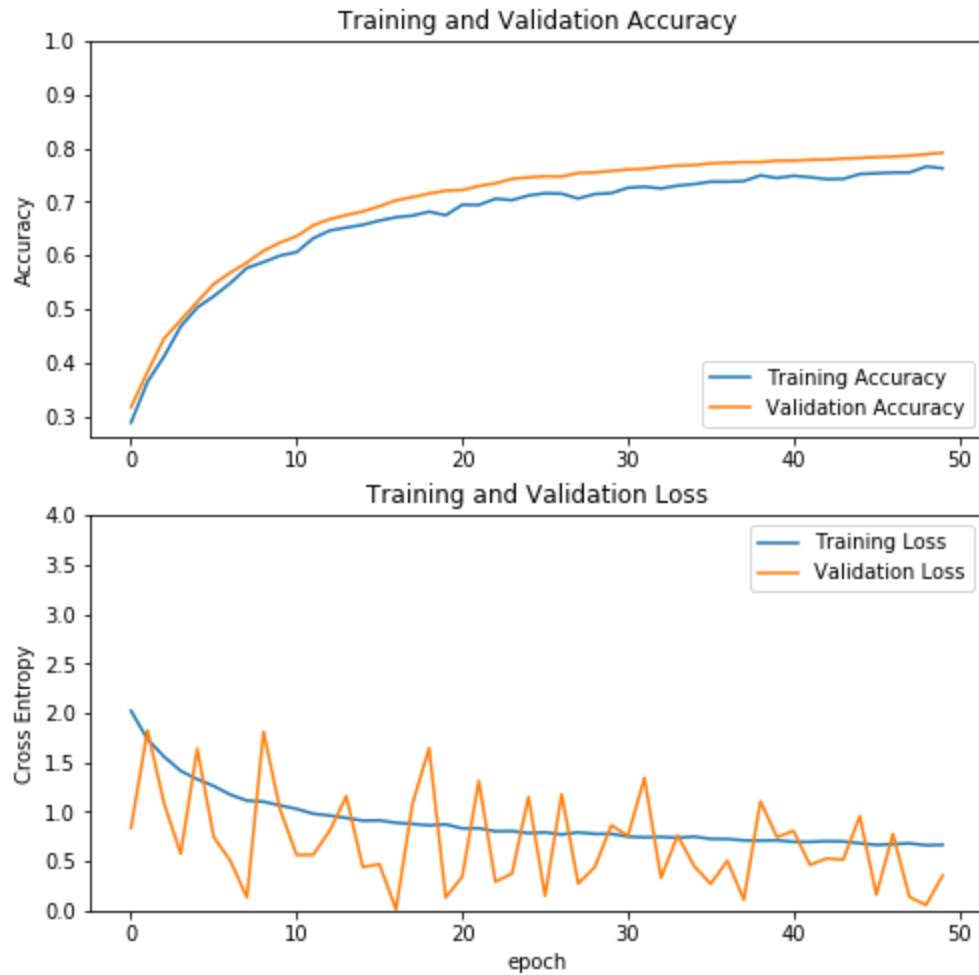
- Dense-512 (prediction)

Fig-02: ResNet50 model training and validation history for batch size-10

Train accuracy - 76%

Train loss - 0.6653

Validation accuracy - 79%

Validation loss - 0.69 (Avg)

Test accuracy - **78.91%**

Accuracy and results-03

Model description

- ResNet50 - 4 upper layers are trainable
- Dropout 0.2
- Flatten
- Dense-512
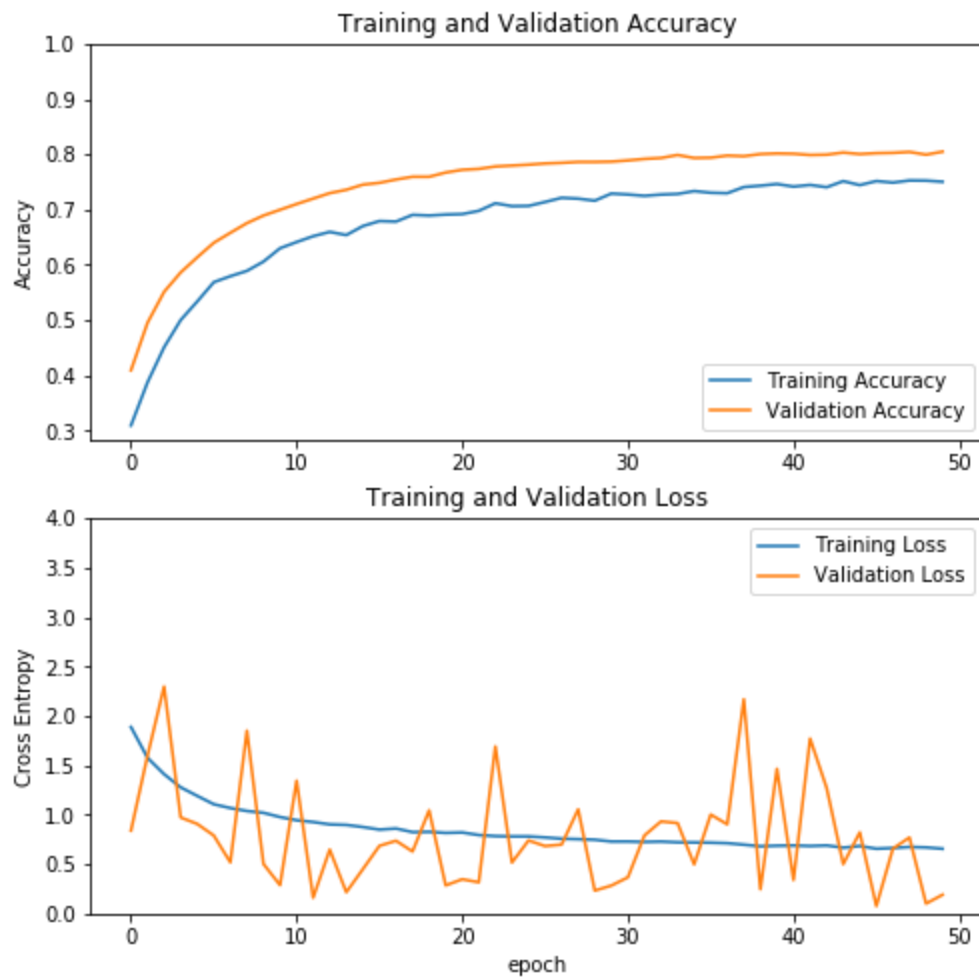- Dropout 0.2
- Dense-512 (prediction)

Fig-03: ResNet50 model training and validation history for batch size-5

Train accuracy - 75%

Train loss -0.65

Validation accuracy - 80%

Validation loss - 0.78 (Avg)

Test accuracy - 78.91%

Accuracy and results-04

Model description

- ResNet50 - All layers trainable=False
- Dropout 0.2
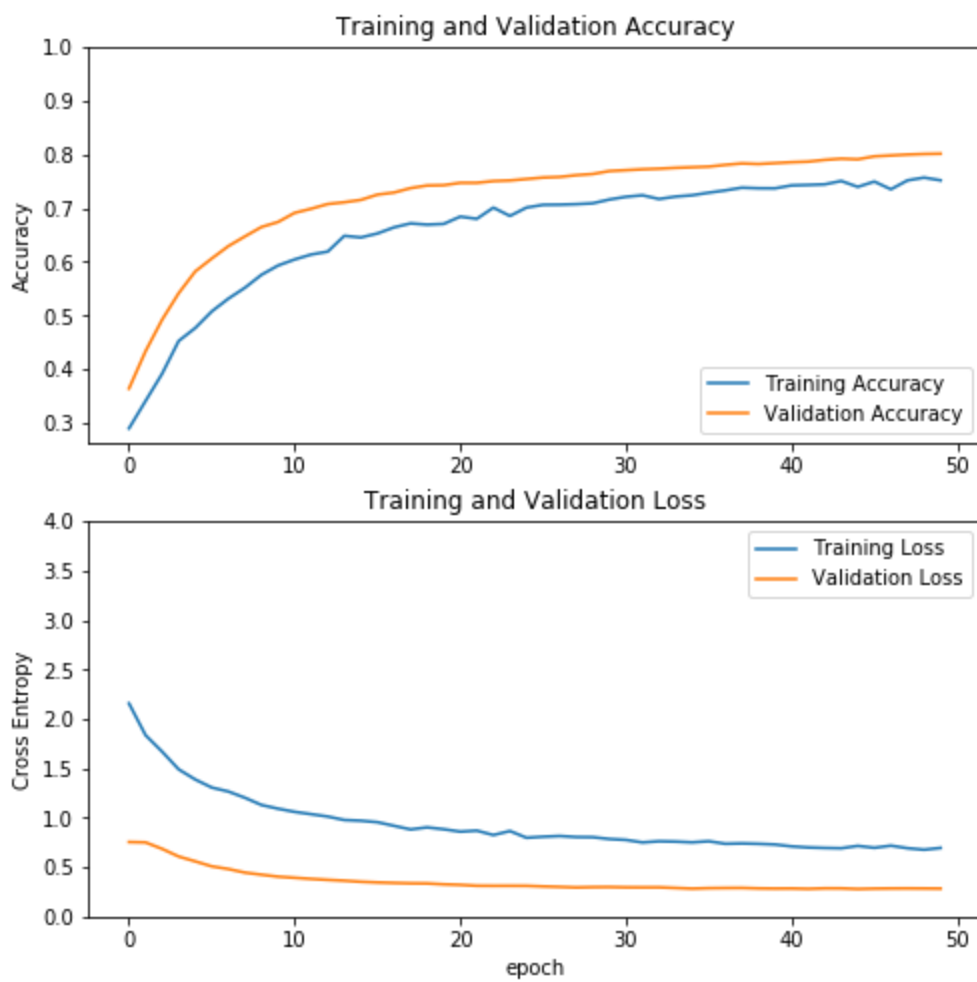- Flatten
- Dense-512
- Dropout 0.2
- Dense-512 (prediction)

Fig-04: ResNet50 model training and validation history for batch size-10 and shuffle=False for validation data.

Train accuracy - 75%

Train loss - 0.69

Validation accuracy - 80%

Validation loss - 0.36 (Avg)

Test accuracy - **79.8%**

Accuracy and results-05

Model description

- ResNet50 - 4 upper layers are trainable
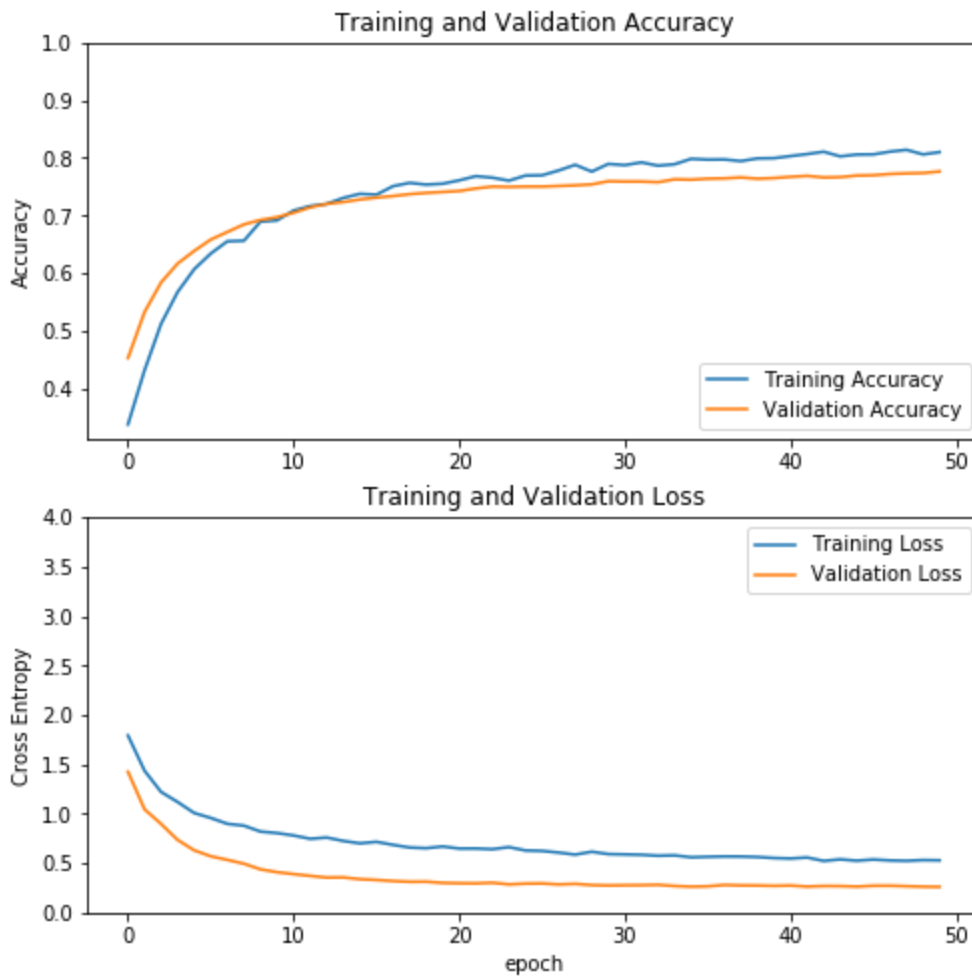- Flatten
- Dense-512 (prediction)

Fig-05: ResNet50 model training and validation history for batch size-10 and removing dropouts.

Train accuracy -81%

Train loss - 0.52

Validation accuracy -77%

Validation loss - 0.37(Avg)

Test accuracy - **76%**

Accuracy and results-06

Model description

- ResNet50 - 4 upper layers are trainable
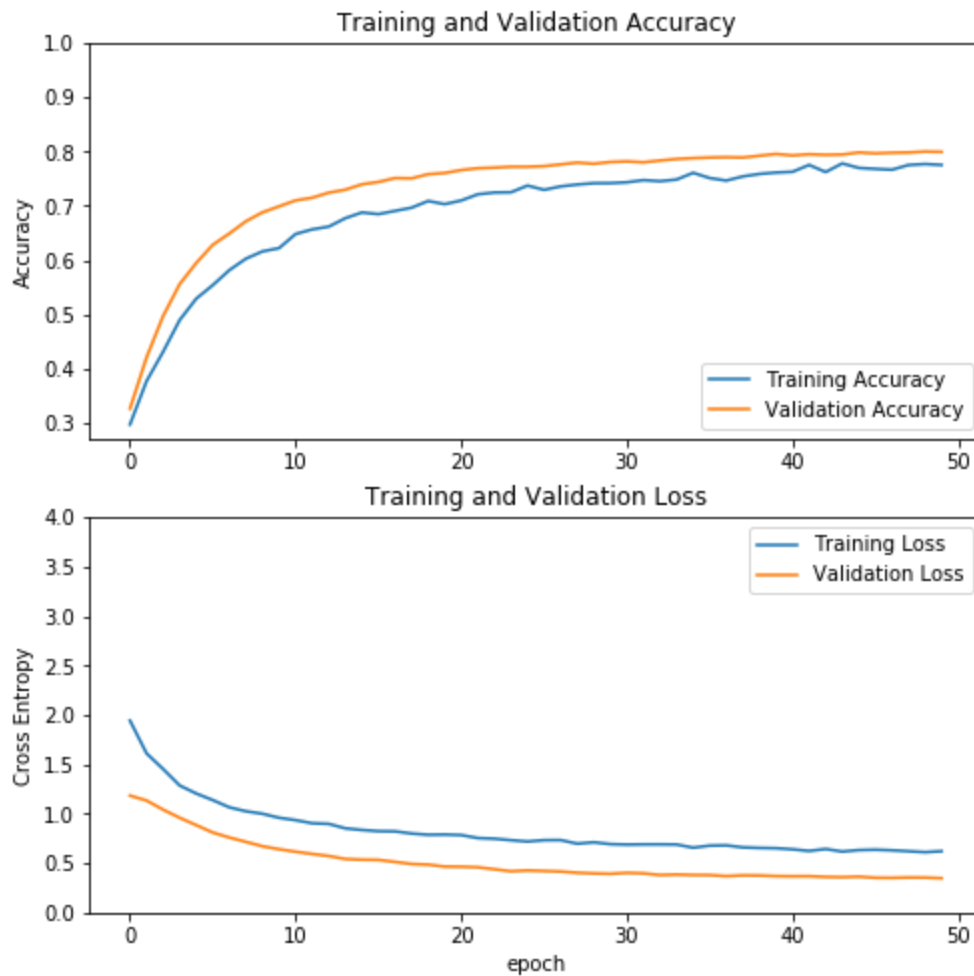- Flatten
- Dense-512
- Dropout 0.2
- Dense-512 (prediction)

Fig-06: ResNet50 model training and validation history for batch size-10, adding a dense layer and a dropout after it.

Train accuracy - 77.5%

Train loss - 0.62

Validation accuracy - 79.9%

Validation loss - 0.34

Test accuracy - **79%**

Accuracy and results-07

Model description

- ResNet50 - 4 upper layers are trainable
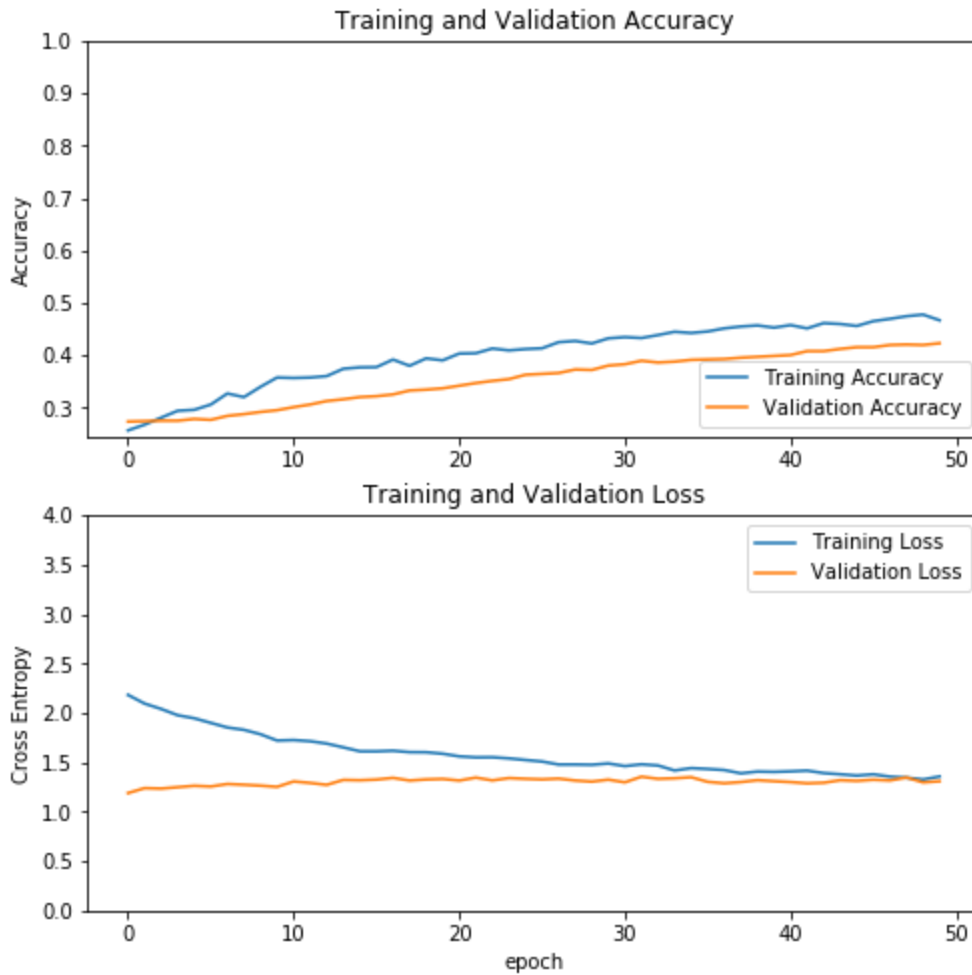- Flatten
- Dense-512
- Dropout 0.2
- Dense-512 (prediction)

Fig-07: ResNet50 model training and validation history for gender classification.

Train accuracy - 46.7%

Train loss - 1.35

Validation accuracy - 42%

Validation loss - 1.3

Test accuracy - 41.4%

Xception

Class Column	# of Classes	Batch size	Data augmentation	Learning rate	Optimizer	Link
subCategory	5	25	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	SGD	Result-8
masterCategory	6	25	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	SGD	Result-09
subCategory	5	25	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	RMSProp	Result-10
subCategory	6	25	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	RMSProp	Result-11
subCategory	4	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001	SGD	Result-12
masterCat	4	10	rotation_range=30	0.00001		Result-06

egory			zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"			
gender	5	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001		Result-07
baseColour	11	10	rotation_range=30 zoom_range=0.15 Width_shift_range=0.2 height_shift_range=0.2 shear_range=0.15 horizontal_flip=True fill_mode="nearest"	0.00001		Result-07

Accuracy and results-08

Model description

- Xception - All layers trainable=False
- Dropout 0.2
- Flatten
- Dense-512
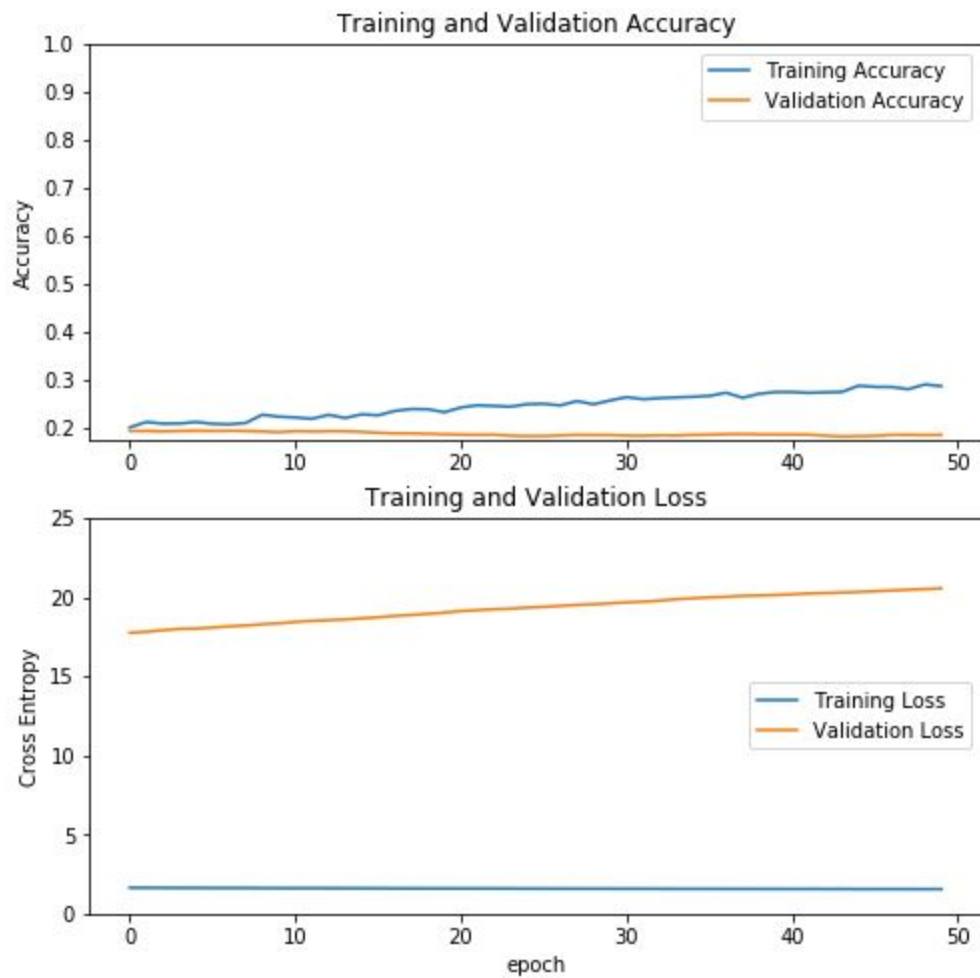- Dropout 0.2
- Dense-512 (prediction)

Fig-01: Xception model training and validation history for batch size-32

Train accuracy - 28.58%

Train loss - 1.55

Validation accuracy - 18.41%

Validation loss - 20.56

Test accuracy - **17.76%**

Accuracy and results-09

Model description

- Xception - All layers trainable=False
- Dropout 0.2
- Flatten
- Dense-512
- Dropout 0.2
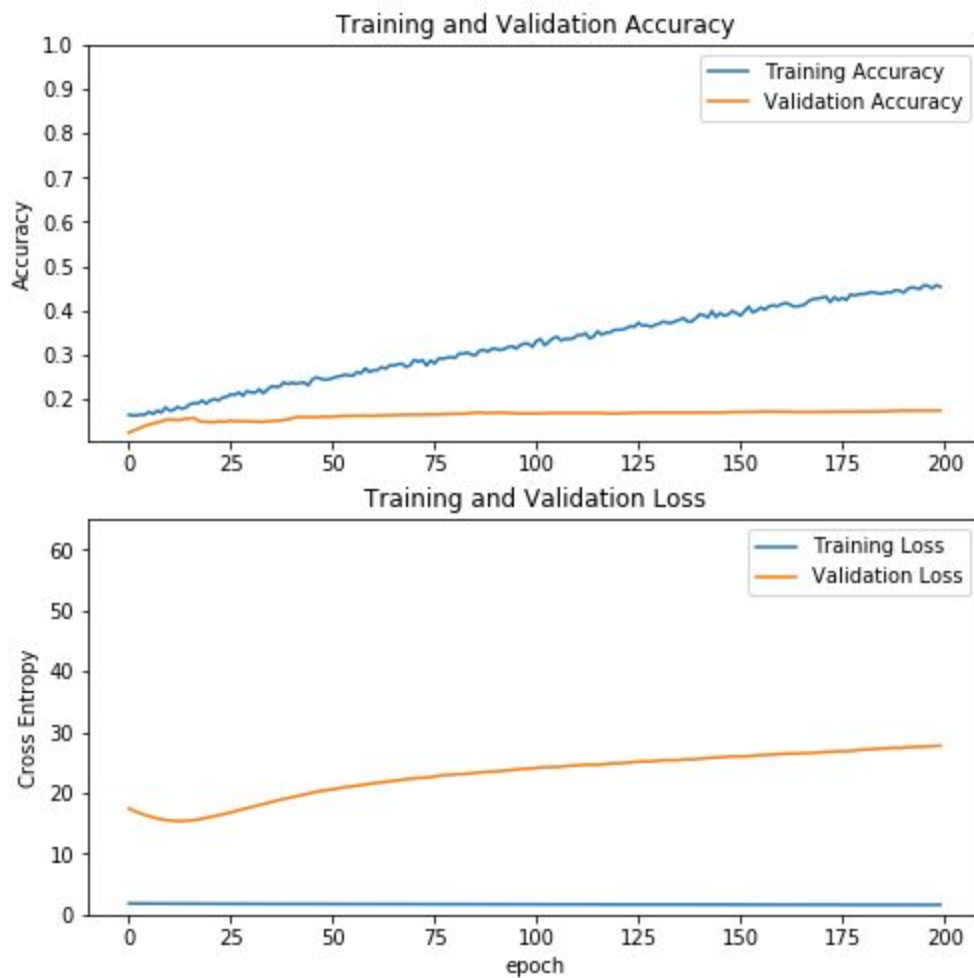- Dense-512 (prediction)

Fig-02: ResNet50 model training and validation history for batch size-10

Train accuracy - 45.28%

Train loss - 1.59

Validation accuracy - 17.32%

Validation loss - 27.76

Test accuracy - **16.56%**

Accuracy and results-10

Model description

- Xception - All layers trainable=False
- Dropout 0.2
- Flatten
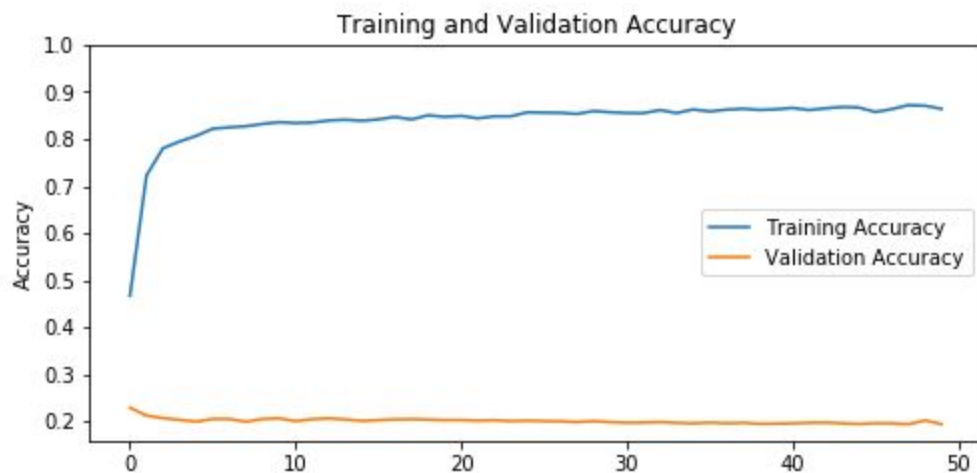- Dense-512
- Dropout 0.2
- Dense-512 (prediction)

Fig-10: Xception model training and validation history for batch size-5

Train accuracy - 86.39%

Train loss -0.476

Validation accuracy - 19.39%

Validation loss - 153.18 (Avg)

Test accuracy - **17.36%**

Accuracy and results-11

Model description

- Xception - All layers trainable=False
- Dropout 0.2
- Flatten
- Dense-512
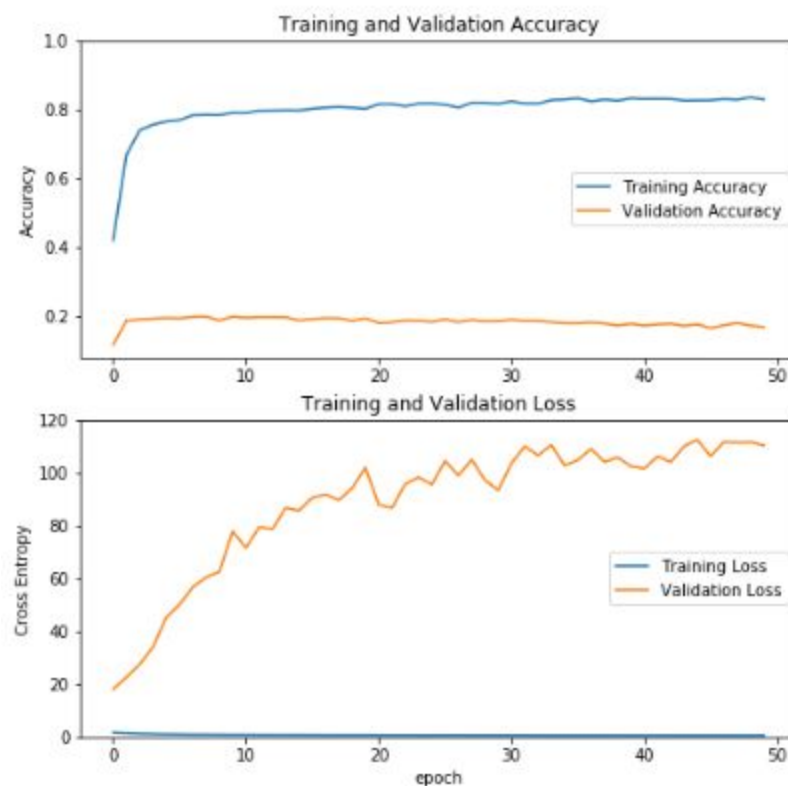- Dropout 0.2
- Dense-512 (prediction)

Fig-04: Xception model training and validation history for batch size-10 and shuffle=False for validation data.

Train accuracy - 83.54%

Train loss - 0.56

Validation accuracy - 18.02%

Validation loss - 106.4

Test accuracy - **16.9%**

Accuracy and results-12

Model description

- Xception- 4 upper layers are trainable
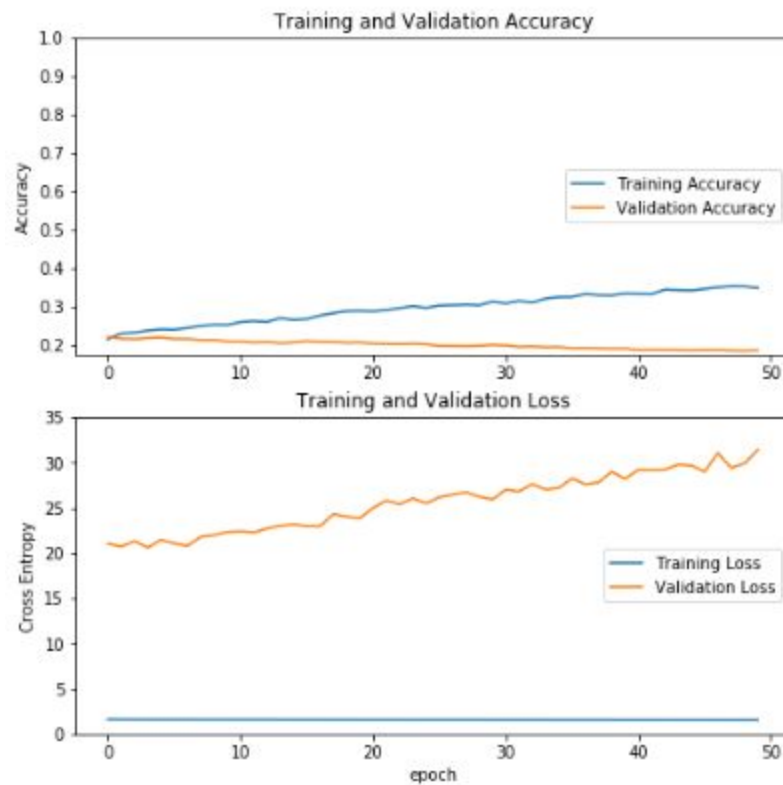- Flatten
- Dense-512 (prediction)

Fig-05: Xception model training and validation history for batch size-10 and removing dropouts.

Train accuracy -34.86%

Train loss - 1.52

Validation accuracy -20.04%

Validation loss - 25.57

Test accuracy - **21.36%**

Accuracy and results-13

Model description

- ResNet50 - 4 upper layers are trainable
- Flatten
- Dense-512
- Dropout 0.2
- Dense-512 (prediction)

Fig-06: ResNet50 model training and validation history for batch size-10, adding a dense layer and a dropout after it.

Train accuracy - 77.5%

Train loss - 0.62

Validation accuracy - 79.9%

Validation loss - 0.34

Test accuracy - **79%**

Accuracy and results-14

Model description

- ResNet50 - 4 upper layers are trainable
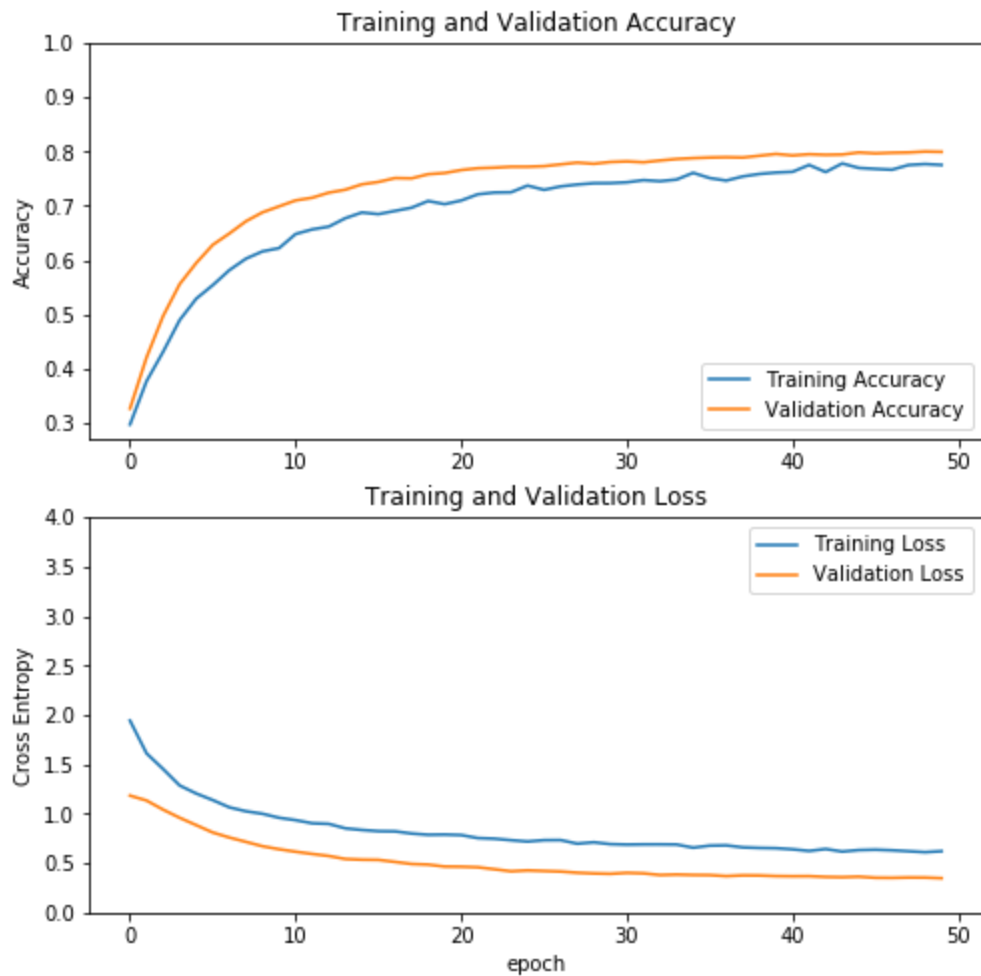- Flatten
- Dense-512
- Dropout 0.2
- Dense-512 (prediction)

Fig-07: ResNet50 model training and validation history for gender classification.

Train accuracy - 46.7%

Train loss - 1.35

Validation accuracy - 42%

Validation loss - 1.3

Test accuracy - **41.4%**

Notes:

1. If dropout is increased, training accuracy degrades. It will help when the model is overfitted.
2. If validation accuracy increases over each epoch and validation loss fluctuates then check if validation data is being shuffled or not. If validation data is being shuffled every time (shuffle=True for imageDataGenerator) then turn it off.
3. When dropout is added in the model, the validation accuracy might be higher than training accuracy. Because validation takes place on the actual model.
4. If the number of data per class is very low or the difference of train data of two classes is high then the accuracy degrades. There should be an equal number of train data in each class or at least the difference must have to be very low.