**Supplementary Material for “Convolutional Neural Networks for Image Classification in Metal Selective Laser Melting Additive Manufacturing”**

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**A. Architectures**

**A.1 NASNetMobile-A**

Model: “NASNetMobile-A model”

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Layer (type) Output Shape Param #

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input\_1 (InputLayer) [(None, 224, 224, 3)] 0

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NASNet (Model) (None, 1056) 4269716

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batch\_normalization (BatchNo (None, 1056) 7392

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dropout (Dropout) (None, 1056) 0

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dense (Dense) (None, 128) 135296

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batch\_normalization\_1 (Batch (None, 128) 896

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dropout\_1 (Dropout) (None, 128) 0

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dense\_1 (Dense) (None, 64) 8256

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dense\_2 (Dense) (None, 2) 130

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Python code for the added layers to the NASNetMobile-A after removing the top layer:

# Block 1

# Batch normalization layer

x = BatchNormalization(momentum=0.9, renorm=True, renorm\_momentum=0.9)(x)

# Dropout layer

x = Dropout(0.2)(x)

# Fully-connected layer

x = Dense(128, activation='relu')(x)

# Block 2

# Batch normalization layer

x = BatchNormalization(momentum=0.9, renorm=True, renorm\_momentum=0.9)(x)

# Dropout layer

x = Dropout(0.2)(x)

# Fully-connected layer

x = Dense(64, activation='relu')(x)

# Classification layer: 2 classes

predictions = Dense(2, activation='softmax')(x)

**A.2 NASNetMobile-B**

Model: “NASNetMobile-B model”

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Layer (type) Output Shape Param #

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input\_1 (InputLayer) [(None, 224, 224, 3)] 0

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NASNet (Model) (None, 1056) 4269716

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dense (Dense) (None, 2) 2114

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Python code for the added layer to the NASNetMobile-B after removing the top layer:

# Classification layer: 2 classes

predictions = Dense(2, activation='softmax')(x)

**A.3 DenseNet121-A**

Model: "DenseNet121-A model"

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Layer (type) Output Shape Param #

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input\_1 (InputLayer) [(None, 192, 256, 3)] 0

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densenet121 (Model) (None, 1024) 7037504

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batch\_normalization (BatchNo (None, 1024) 7168

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dropout (Dropout) (None, 1024) 0

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dense (Dense) (None, 128) 131200

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batch\_normalization\_1 (Batch (None, 128) 896

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dropout\_1 (Dropout) (None, 128) 0

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dense\_1 (Dense) (None, 64) 8256

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dense\_2 (Dense) (None, 2) 130

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**A.4 DenseNet121-B**

Model: "DenseNet121-B model"

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Layer (type) Output Shape Param #

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input\_1 (InputLayer) [(None, 192, 256, 3)] 0

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densenet121 (Model) (None, 1024) 7037504

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dense (Dense) (None, 256) 262400

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dropout (Dropout) (None, 256) 0

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dense\_1 (Dense) (None, 2) 514

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**A.5 Custom CNN**

Model: "Custom CNN model"

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Layer (type) Output Shape Param #

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conv2d (Conv2D) (None, 220, 220, 32) 2432

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conv2d\_1 (Conv2D) (None, 216, 216, 32) 25632

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max\_pooling2d (MaxPooling2D) (None, 108, 108, 32) 0

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dropout (Dropout) (None, 108, 108, 32) 0

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conv2d\_2 (Conv2D) (None, 106, 106, 64) 18496

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conv2d\_3 (Conv2D) (None, 104, 104, 64) 36928

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max\_pooling2d\_1 (MaxPooling2 (None, 52, 52, 64) 0

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dropout\_1 (Dropout) (None, 52, 52, 64) 0

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flatten (Flatten) (None, 173056) 0

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dense (Dense) (None, 256) 44302592

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dropout\_2 (Dropout) (None, 256) 0

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dense\_1 (Dense) (None, 2) 514

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**B. Methods**

The NASNetMobile, DenseNet based models, and the custom CNN were compiled using binary cross entropy loss and the metric was accuracy.

For training, early stopping was employed to avoid overfitting by monitoring the validation loss with a patience of 10 epochs. During training, the best models were stored by monitoring the validation accuracy. The models were set to train up to 20 epochs.