```
Model: "capacity_prediction"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 rescaling (Rescaling)       (None, 5, 1, 1)           0

 conv2d (Conv2D)             (None, 3, 1, 32)          128

 re_lu (ReLU)                (None, 3, 1, 32)          0

 conv2d_1 (Conv2D)           (None, 1, 1, 64)          6208

 re_lu_1 (ReLU)              (None, 1, 1, 64)          0

 flatten (Flatten)           (None, 64)                0

 dense (Dense)               (None, 1)                 65

=================================================================
Total params: 6401 (25.00 KB)
Trainable params: 6401 (25.00 KB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
Epoch 1/50
WARNING:tensorflow:From
C:\Users\HP\anaconda3\envs\akida_env\lib\site-packages\keras\src\utils\tf_utils.
py:492: The name tf.ragged.RaggedTensorValue is deprecated. Please use
tf.compat.v1.ragged.RaggedTensorValue instead.

WARNING:tensorflow:From
C:\Users\HP\anaconda3\envs\akida_env\lib\site-packages\keras\src\engine\base_lay
er_utils.py:384: The name tf.executing_eagerly_outside_functions is deprecated.
Please use tf.compat.v1.executing_eagerly_outside_functions instead.

55/55 [==============================] - 4s 30ms/step - loss: 0.1520 - mae:
0.3200 - val_loss: 0.2539 - val_mae: 0.5035
Epoch 2/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0621 - mae:
0.2145 - val_loss: 0.2170 - val_mae: 0.4655
Epoch 3/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0616 - mae:
0.2133 - val_loss: 0.2457 - val_mae: 0.4953
Epoch 4/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0611 - mae:
0.2127 - val_loss: 0.2033 - val_mae: 0.4505
Epoch 5/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0602 - mae:
0.2111 - val_loss: 0.2155 - val_mae: 0.4638
Epoch 6/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0593 - mae:
0.2097 - val_loss: 0.1817 - val_mae: 0.4259
Epoch 7/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0588 - mae:
0.2078 - val_loss: 0.1899 - val_mae: 0.4353
```

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Epoch 8/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0573 - mae:
0.2051 - val_loss: 0.1918 - val_mae: 0.4375
Epoch 9/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0544 - mae:
0.2008 - val_loss: 0.1659 - val_mae: 0.4068
Epoch 10/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0512 - mae:
0.1946 - val_loss: 0.1597 - val_mae: 0.3992
Epoch 11/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0475 - mae:
0.1869 - val_loss: 0.1579 - val_mae: 0.3969
Epoch 12/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0417 - mae:
0.1751 - val_loss: 0.1488 - val_mae: 0.3854
Epoch 13/50
55/55 [==============================] - 1s 18ms/step - loss: 0.0353 - mae:
0.1608 - val_loss: 0.1020 - val_mae: 0.3188
Epoch 14/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0266 - mae:
0.1395 - val_loss: 0.0832 - val_mae: 0.2880
Epoch 15/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0172 - mae:
0.1119 - val_loss: 0.0662 - val_mae: 0.2569
Epoch 16/50
55/55 [==============================] - 1s 19ms/step - loss: 0.0086 - mae:
0.0777 - val_loss: 0.0241 - val_mae: 0.1543
Epoch 17/50
55/55 [==============================] - 1s 17ms/step - loss: 0.0033 - mae:
0.0467 - val_loss: 0.0034 - val_mae: 0.0558
Epoch 18/50
55/55 [==============================] - 1s 19ms/step - loss: 9.9644e-04 - mae:
0.0252 - val_loss: 6.9342e-04 - val_mae: 0.0223
Epoch 19/50
55/55 [==============================] - 1s 19ms/step - loss: 5.9780e-04 - mae:
0.0180 - val_loss: 6.0636e-04 - val_mae: 0.0207
Epoch 20/50
55/55 [==============================] - 1s 19ms/step - loss: 6.0957e-04 - mae:
0.0184 - val_loss: 3.9346e-04 - val_mae: 0.0167
Epoch 21/50
55/55 [==============================] - 1s 18ms/step - loss: 6.0453e-04 - mae:
0.0179 - val_loss: 4.1832e-04 - val_mae: 0.0172
Epoch 22/50
55/55 [==============================] - 1s 19ms/step - loss: 5.7601e-04 - mae:
0.0176 - val_loss: 8.8067e-04 - val_mae: 0.0256
Epoch 23/50
55/55 [==============================] - 1s 17ms/step - loss: 5.8649e-04 - mae:
0.0179 - val_loss: 2.8709e-04 - val_mae: 0.0144
Epoch 24/50
55/55 [==============================] - 1s 19ms/step - loss: 5.7719e-04 - mae:
0.0175 - val_loss: 3.8709e-04 - val_mae: 0.0166
Epoch 25/50
55/55 [==============================] - 1s 19ms/step - loss: 7.3813e-04 - mae:
0.0207 - val_loss: 2.9225e-04 - val_mae: 0.0145
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Epoch 26/50
55/55 [==============================] - 1s 18ms/step - loss: 5.8549e-04 - mae:
0.0178 - val_loss: 5.1391e-04 - val_mae: 0.0189
Epoch 27/50
55/55 [==============================] - 1s 17ms/step - loss: 5.6857e-04 - mae:
0.0173 - val_loss: 4.0925e-04 - val_mae: 0.0170
Epoch 28/50
55/55 [==============================] - 1s 18ms/step - loss: 5.8980e-04 - mae:
0.0179 - val_loss: 7.1877e-04 - val_mae: 0.0227
Epoch 29/50
55/55 [==============================] - 1s 18ms/step - loss: 5.6838e-04 - mae:
0.0171 - val_loss: 4.2293e-04 - val_mae: 0.0172
Epoch 30/50
55/55 [==============================] - 1s 18ms/step - loss: 5.7825e-04 - mae:
0.0176 - val_loss: 4.7310e-04 - val_mae: 0.0182
Epoch 31/50
55/55 [==============================] - 1s 19ms/step - loss: 6.8744e-04 - mae:
0.0199 - val_loss: 6.0082e-04 - val_mae: 0.0205
Epoch 32/50
55/55 [==============================] - 1s 18ms/step - loss: 5.9973e-04 - mae:
0.0181 - val_loss: 4.0527e-04 - val_mae: 0.0169
Epoch 33/50
55/55 [==============================] - 1s 19ms/step - loss: 6.0779e-04 - mae:
0.0182 - val_loss: 4.0628e-04 - val_mae: 0.0169
Epoch 34/50
55/55 [==============================] - 1s 19ms/step - loss: 5.8694e-04 - mae:
0.0178 - val_loss: 3.4791e-04 - val_mae: 0.0157
Epoch 35/50
55/55 [==============================] - 1s 18ms/step - loss: 6.2889e-04 - mae:
0.0187 - val_loss: 2.9257e-04 - val_mae: 0.0145
Epoch 36/50
55/55 [==============================] - 1s 18ms/step - loss: 6.0847e-04 - mae:
0.0182 - val_loss: 0.0011 - val_mae: 0.0289
Epoch 37/50
55/55 [==============================] - 1s 18ms/step - loss: 6.2144e-04 - mae:
0.0185 - val_loss: 5.4316e-04 - val_mae: 0.0195
Epoch 38/50
55/55 [==============================] - 1s 18ms/step - loss: 5.7795e-04 - mae:
0.0178 - val_loss: 4.3440e-04 - val_mae: 0.0174
Epoch 39/50
55/55 [==============================] - 1s 18ms/step - loss: 6.1207e-04 - mae:
0.0182 - val_loss: 8.3982e-04 - val_mae: 0.0249
Epoch 40/50
55/55 [==============================] - 1s 17ms/step - loss: 5.6210e-04 - mae:
0.0171 - val_loss: 3.4916e-04 - val_mae: 0.0158
Epoch 41/50
55/55 [==============================] - 1s 16ms/step - loss: 5.7761e-04 - mae:
0.0176 - val_loss: 5.3254e-04 - val_mae: 0.0193
Epoch 42/50
55/55 [==============================] - 1s 17ms/step - loss: 5.4995e-04 - mae:
0.0169 - val_loss: 3.2306e-04 - val_mae: 0.0152
Epoch 43/50
55/55 [==============================] - 1s 18ms/step - loss: 7.3578e-04 - mae:
0.0207 - val_loss: 0.0015 - val_mae: 0.0348
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Epoch 44/50
55/55 [==============================] - 1s 19ms/step - loss: 6.4935e-04 - mae:
0.0192 - val_loss: 5.4544e-04 - val_mae: 0.0195
Epoch 45/50
55/55 [==============================] - 1s 19ms/step - loss: 6.1611e-04 - mae:
0.0186 - val_loss: 7.0121e-04 - val_mae: 0.0224
Epoch 46/50
55/55 [==============================] - 1s 19ms/step - loss: 7.5728e-04 - mae:
0.0209 - val_loss: 7.7631e-04 - val_mae: 0.0238
Epoch 47/50
55/55 [==============================] - 1s 18ms/step - loss: 5.4863e-04 - mae:
0.0171 - val_loss: 3.3501e-04 - val_mae: 0.0154
Epoch 48/50
55/55 [==============================] - 1s 17ms/step - loss: 5.4625e-04 - mae:
0.0168 - val_loss: 5.0742e-04 - val_mae: 0.0188
Epoch 49/50
55/55 [==============================] - 1s 19ms/step - loss: 5.4488e-04 - mae:
0.0169 - val_loss: 3.9443e-04 - val_mae: 0.0166
Epoch 50/50
55/55 [==============================] - 1s 18ms/step - loss: 5.5870e-04 - mae:
0.0173 - val_loss: 5.4499e-04 - val_mae: 0.0195
Test MAE (original): 0.02500135451555252
C:\Users\HP\anaconda3\envs\akida_env\lib\site-packages\quantizeml\models\quantiz
e.py:481: UserWarning: Quantizing per-axis with random calibration samples is
not accurate.                         Set
QuantizationParams.per_tensor_activations=True when calibrating with
           random samples.
  warnings.warn("Quantizing per-axis with random calibration samples is not
accurate.\
1024/1024 [==============================] - 6s 6ms/step
WARNING:tensorflow:From
C:\Users\HP\anaconda3\envs\akida_env\lib\site-packages\keras\src\optimizers\__in
it__.py:309: The name tf.train.Optimizer is deprecated. Please use
tf.compat.v1.train.Optimizer instead.

Test MAE after 4-bit quantization: 0.02452794462442398
11/11 [==============================] - 1s 7ms/step
11/11 [==============================] - 0s 3ms/step
Test MAE after 4-bit calibration: 0.18562564253807068
Epoch 1/30
55/55 [==============================] - 19s 105ms/step - loss: 0.5246 - mae:
0.6793 - val_loss: 0.0431 - val_mae: 0.2068
Epoch 2/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5245 - mae:
0.6792 - val_loss: 0.0431 - val_mae: 0.2067
Epoch 3/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5244 - mae:
0.6792 - val_loss: 0.0431 - val_mae: 0.2066
Epoch 4/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5243 - mae:
0.6791 - val_loss: 0.0430 - val_mae: 0.2066
Epoch 5/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5242 - mae:
0.6790 - val_loss: 0.0430 - val_mae: 0.2065
```

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Epoch 6/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5242 - mae:
0.6790 - val_loss: 0.0430 - val_mae: 0.2064
Epoch 7/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5241 - mae:
0.6789 - val_loss: 0.0429 - val_mae: 0.2063
Epoch 8/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5240 - mae:
0.6788 - val_loss: 0.0429 - val_mae: 0.2063
Epoch 9/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5239 - mae:
0.6788 - val_loss: 0.0429 - val_mae: 0.2062
Epoch 10/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5238 - mae:
0.6787 - val_loss: 0.0429 - val_mae: 0.2061
Epoch 11/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5237 - mae:
0.6786 - val_loss: 0.0428 - val_mae: 0.2061
Epoch 12/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5164 - mae:
0.6731 - val_loss: 0.0382 - val_mae: 0.1945
Epoch 13/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5081 - mae:
0.6670 - val_loss: 0.0382 - val_mae: 0.1945
Epoch 14/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5080 - mae:
0.6670 - val_loss: 0.0382 - val_mae: 0.1944
Epoch 15/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5079 - mae:
0.6669 - val_loss: 0.0381 - val_mae: 0.1944
Epoch 16/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5079 - mae:
0.6669 - val_loss: 0.0381 - val_mae: 0.1943
Epoch 17/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5078 - mae:
0.6668 - val_loss: 0.0381 - val_mae: 0.1943
Epoch 18/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5077 - mae:
0.6667 - val_loss: 0.0381 - val_mae: 0.1942
Epoch 19/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5076 - mae:
0.6667 - val_loss: 0.0381 - val_mae: 0.1941
Epoch 20/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5075 - mae:
0.6666 - val_loss: 0.0380 - val_mae: 0.1941
Epoch 21/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5074 - mae:
0.6666 - val_loss: 0.0380 - val_mae: 0.1940
Epoch 22/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5074 - mae:
0.6665 - val_loss: 0.0380 - val_mae: 0.1939
Epoch 23/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5073 - mae:
0.6664 - val_loss: 0.0380 - val_mae: 0.1939
```

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Epoch 24/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5072 - mae:
0.6664 - val_loss: 0.0379 - val_mae: 0.1938
Epoch 25/30
55/55 [==============================] - 1s 18ms/step - loss: 0.5071 - mae:
0.6663 - val_loss: 0.0379 - val_mae: 0.1937
Epoch 26/30
55/55 [==============================] - 1s 17ms/step - loss: 0.5070 - mae:
0.6662 - val_loss: 0.0379 - val_mae: 0.1937
Epoch 27/30
55/55 [==============================] - 1s 18ms/step - loss: 0.4989 - mae:
0.6600 - val_loss: 0.0258 - val_mae: 0.1595
Epoch 28/30
55/55 [==============================] - 1s 18ms/step - loss: 0.4626 - mae:
0.6320 - val_loss: 0.0258 - val_mae: 0.1594
Epoch 29/30
55/55 [==============================] - 1s 17ms/step - loss: 0.4625 - mae:
0.6319 - val_loss: 0.0258 - val_mae: 0.1594
Epoch 30/30
55/55 [==============================] - 1s 17ms/step - loss: 0.4624 - mae:
0.6319 - val_loss: 0.0258 - val_mae: 0.1593
Test MAE after fine tuning: 0.1381327211856842
                Model Summary
_____________________________________________
Input shape  Output shape  Sequences  Layers
=============================================
[5, 1, 1]    [1, 1, 1]     1          3
_____________________________________________

_____________________________________________________________
Layer (type)         Output shape  Kernel shape

============ SW/conv2d-dense (Software) ===========

conv2d (InputConv.)  [3, 1, 32]    (3, 1, 1, 32)
_____________________________________________________________
conv2d_1 (Conv.)     [1, 1, 64]    (3, 1, 32, 64)
_____________________________________________________________
dense (Fully.)       [1, 1, 1]     (1, 1, 64, 1)
_____________________________________________________________
Test MAE after conversion : 0.014673712100995632
First 5 predictions (original scale): [696.5376  699.05505 698.8082  695.5751
691.799  ]
First 5 true values (original scale): [704.57172222 693.14144444 680.87333333
682.00022222 684.50888889]
```