```
Layer (type)                 Output Shape              Param #
=================================================================
input_39 (InputLayer)        (None, 32, 20, 20, 1)     0
_____
conv3d_108 (Conv3D)          (None, 32, 20, 20, 16)    144
_____
conv3d_109 (Conv3D)          (None, 16, 10, 20, 32)    4128
_____
conv3d_110 (Conv3D)          (None, 8, 5, 20, 64)      16448
_____
conv3d_111 (Conv3D)          (None, 4, 3, 20, 128)     65664
_____
conv3d_transpose_98 (Conv3DT (None, 8, 6, 21, 128)     131200
_____
lambda_10 (Lambda)           (None, 8, 5, 20, 128)     0
_____
conv3d_transpose_99 (Conv3DT (None, 16, 10, 20, 64)    65600
_____
conv3d_transpose_100 (Conv3D (None, 32, 20, 20, 32)    16416
_____
conv3d_transpose_101 (Conv3D (None, 32, 20, 20, 1)     257
=================================================================
Total params: 299,857
Trainable params: 299,857
Non-trainable params: 0
_____
Train on 320 samples, validate on 80 samples
Epoch 1/50
288/320 [===========================>...] - ETA: 0s - loss: 0.1212 - mean_squared_error: 0.1212
Epoch 00001: val_loss improved from inf to 0.11904, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 5s 15ms/sample - loss: 0.1210 - mean_squared_error: 0.1210 - val_loss: 0.1190 -
val_mean_squared_error: 0.1190
Epoch 2/50
288/320 [===========================>...] - ETA: 0s - loss: 0.1170 - mean_squared_error: 0.1170
Epoch 00002: val_loss improved from 0.11904 to 0.11323, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.1167 - mean_squared_error: 0.1167 - val_loss: 0.1132 -
val_mean_squared_error: 0.1132
Epoch 3/50
288/320 [===========================>...] - ETA: 0s - loss: 0.1092 - mean_squared_error: 0.1092
Epoch 00003: val_loss improved from 0.11323 to 0.10085, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.1085 - mean_squared_error: 0.1085 - val_loss: 0.1008 -
val_mean_squared_error: 0.1008
Epoch 4/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0908 - mean_squared_error: 0.0908
Epoch 00004: val_loss improved from 0.10085 to 0.06978, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0892 - mean_squared_error: 0.0892 - val_loss: 0.0698 -
val_mean_squared_error: 0.0698
Epoch 5/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0481 - mean_squared_error: 0.0481
Epoch 00005: val_loss improved from 0.06978 to 0.01676, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0453 - mean_squared_error: 0.0453 - val_loss: 0.0168 -
val_mean_squared_error: 0.0168
Epoch 6/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0180 - mean_squared_error: 0.0180
Epoch 00006: val_loss improved from 0.01676 to 0.01546, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0179 - mean_squared_error: 0.0179 - val_loss: 0.0155 -
val_mean_squared_error: 0.0155
Epoch 7/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0126 - mean_squared_error: 0.0126
Epoch 00007: val_loss improved from 0.01546 to 0.01244, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 0.0126 - mean_squared_error: 0.0126 - val_loss: 0.0124 -
val_mean_squared_error: 0.0124
Epoch 8/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0112 - mean_squared_error: 0.0112
Epoch 00008: val_loss improved from 0.01244 to 0.00990, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 0.0110 - mean_squared_error: 0.0110 - val_loss: 0.0099 -
val_mean_squared_error: 0.0099
Epoch 9/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0096 - mean_squared_error: 0.0096
Epoch 00009: val_loss improved from 0.00990 to 0.00880, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0095 - mean_squared_error: 0.0095 - val_loss: 0.0088 -
val_mean_squared_error: 0.0088
Epoch 10/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0085 - mean_squared_error: 0.0085
Epoch 00010: val_loss improved from 0.00880 to 0.00804, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0085 - mean_squared_error: 0.0085 - val_loss: 0.0080 -
val_mean_squared_error: 0.0080
Epoch 11/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0078 - mean_squared_error: 0.0078
Epoch 00011: val_loss improved from 0.00804 to 0.00740, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 0.0077 - mean_squared_error: 0.0077 - val_loss: 0.0074 -
val_mean_squared_error: 0.0074
Epoch 12/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0072 - mean_squared_error: 0.0072
Epoch 00012: val_loss improved from 0.00740 to 0.00687, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0072 - mean_squared_error: 0.0072 - val_loss: 0.0069 -
val_mean_squared_error: 0.0069
Epoch 13/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0067 - mean_squared_error: 0.0067
Epoch 00013: val_loss improved from 0.00687 to 0.00636, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0066 - mean_squared_error: 0.0066 - val_loss: 0.0064 -
val_mean_squared_error: 0.0064
Epoch 14/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0062 - mean_squared_error: 0.0062
Epoch 00014: val_loss improved from 0.00636 to 0.00584, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0061 - mean_squared_error: 0.0061 - val_loss: 0.0058 -
val_mean_squared_error: 0.0058
Epoch 15/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0056 - mean_squared_error: 0.0056
Epoch 00015: val_loss improved from 0.00584 to 0.00529, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0056 - mean_squared_error: 0.0056 - val_loss: 0.0053 -
val_mean_squared_error: 0.0053
Epoch 16/50
288/320 [===========================>...] - ETA: 0s - loss: 0.0051 - mean_squared_error: 0.0051
Epoch 00016: val_loss improved from 0.00529 to 0.00469, saving model to CA3ModelV1_model.hdf5
```

```
320/320 [==============================] - 1s 4ms/sample - loss: 0.0050 - mean_squared_error: 0.0050 - val_loss: 0.0047 -
val_mean_squared_error: 0.0047
Epoch 17/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0044 - mean_squared_error: 0.0044
Epoch 00017: val_loss improved from 0.00469 to 0.00404, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 0.0044 - mean_squared_error: 0.0044 - val_loss: 0.0040 -
val_mean_squared_error: 0.0040
Epoch 18/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0038 - mean_squared_error: 0.0038
Epoch 00018: val_loss improved from 0.00404 to 0.00337, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 0.0037 - mean_squared_error: 0.0037 - val_loss: 0.0034 -
val_mean_squared_error: 0.0034
Epoch 19/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0031 - mean_squared_error: 0.0031
Epoch 00019: val_loss improved from 0.00337 to 0.00271, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0031 - mean_squared_error: 0.0031 - val_loss: 0.0027 -
val_mean_squared_error: 0.0027
Epoch 20/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0025 - mean_squared_error: 0.0025
Epoch 00020: val_loss improved from 0.00271 to 0.00213, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0024 - mean_squared_error: 0.0024 - val_loss: 0.0021 -
val_mean_squared_error: 0.0021
Epoch 21/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0019 - mean_squared_error: 0.0019
Epoch 00021: val_loss improved from 0.00213 to 0.00163, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0019 - mean_squared_error: 0.0019 - val_loss: 0.0016 -
val_mean_squared_error: 0.0016
Epoch 22/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0015 - mean_squared_error: 0.0015
Epoch 00022: val_loss improved from 0.00163 to 0.00122, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0014 - mean_squared_error: 0.0014 - val_loss: 0.0012 -
val_mean_squared_error: 0.0012
Epoch 23/50
288/320 [==========================>...] - ETA: 0s - loss: 0.0011 - mean_squared_error: 0.0011
Epoch 00023: val_loss improved from 0.00122 to 0.00088, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 0.0011 - mean_squared_error: 0.0011 - val_loss: 8.8021e-04 -
val_mean_squared_error: 8.8021e-04
Epoch 24/50
288/320 [==========================>...] - ETA: 0s - loss: 7.6900e-04 - mean_squared_error: 7.6900e-04
Epoch 00024: val_loss improved from 0.00088 to 0.00062, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 7.5626e-04 - mean_squared_error: 7.5626e-04 - val_loss: 6.1954e-04 -
val_mean_squared_error: 6.1954e-04
Epoch 25/50
288/320 [==========================>...] - ETA: 0s - loss: 5.4047e-04 - mean_squared_error: 5.4047e-04
Epoch 00025: val_loss improved from 0.00062 to 0.00044, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 5.3191e-04 - mean_squared_error: 5.3191e-04 - val_loss: 4.4137e-04 -
val_mean_squared_error: 4.4137e-04
Epoch 26/50
288/320 [==========================>...] - ETA: 0s - loss: 3.9566e-04 - mean_squared_error: 3.9566e-04
Epoch 00026: val_loss improved from 0.00044 to 0.00034, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 3.9106e-04 - mean_squared_error: 3.9106e-04 - val_loss: 3.4271e-04 -
val_mean_squared_error: 3.4271e-04
Epoch 27/50
288/320 [==========================>...] - ETA: 0s - loss: 3.1919e-04 - mean_squared_error: 3.1919e-04
Epoch 00027: val_loss improved from 0.00034 to 0.00029, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 3.1668e-04 - mean_squared_error: 3.1668e-04 - val_loss: 2.9046e-04 -
val_mean_squared_error: 2.9046e-04
Epoch 28/50
288/320 [==========================>...] - ETA: 0s - loss: 2.7514e-04 - mean_squared_error: 2.7514e-04
Epoch 00028: val_loss improved from 0.00029 to 0.00026, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 2.7342e-04 - mean_squared_error: 2.7342e-04 - val_loss: 2.5504e-04 -
val_mean_squared_error: 2.5504e-04
Epoch 29/50
288/320 [==========================>...] - ETA: 0s - loss: 2.4312e-04 - mean_squared_error: 2.4312e-04
Epoch 00029: val_loss improved from 0.00026 to 0.00023, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 2.4180e-04 - mean_squared_error: 2.4180e-04 - val_loss: 2.2755e-04 -
val_mean_squared_error: 2.2755e-04
Epoch 30/50
288/320 [==========================>...] - ETA: 0s - loss: 2.1787e-04 - mean_squared_error: 2.1787e-04
Epoch 00030: val_loss improved from 0.00023 to 0.00021, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 2.1680e-04 - mean_squared_error: 2.1680e-04 - val_loss: 2.0526e-04 -
val_mean_squared_error: 2.0526e-04
Epoch 31/50
288/320 [==========================>...] - ETA: 0s - loss: 1.9740e-04 - mean_squared_error: 1.9740e-04
Epoch 00031: val_loss improved from 0.00021 to 0.00019, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 1.9647e-04 - mean_squared_error: 1.9647e-04 - val_loss: 1.8699e-04 -
val_mean_squared_error: 1.8699e-04
Epoch 32/50
288/320 [==========================>...] - ETA: 0s - loss: 1.8041e-04 - mean_squared_error: 1.8041e-04
Epoch 00032: val_loss improved from 0.00019 to 0.00017, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 1.7964e-04 - mean_squared_error: 1.7964e-04 - val_loss: 1.7174e-04 -
val_mean_squared_error: 1.7174e-04
Epoch 33/50
288/320 [==========================>...] - ETA: 0s - loss: 1.6608e-04 - mean_squared_error: 1.6608e-04
Epoch 00033: val_loss improved from 0.00017 to 0.00016, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 1.6541e-04 - mean_squared_error: 1.6541e-04 - val_loss: 1.5858e-04 -
val_mean_squared_error: 1.5858e-04
Epoch 34/50
288/320 [==========================>...] - ETA: 0s - loss: 1.5356e-04 - mean_squared_error: 1.5356e-04
Epoch 00034: val_loss improved from 0.00016 to 0.00015, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 1.5298e-04 - mean_squared_error: 1.5298e-04 - val_loss: 1.4698e-04 -
val_mean_squared_error: 1.4698e-04
Epoch 35/50
288/320 [==========================>...] - ETA: 0s - loss: 1.4251e-04 - mean_squared_error: 1.4251e-04
Epoch 00035: val_loss improved from 0.00015 to 0.00014, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 1.4197e-04 - mean_squared_error: 1.4197e-04 - val_loss: 1.3658e-04 -
val_mean_squared_error: 1.3658e-04
Epoch 36/50
288/320 [==========================>...] - ETA: 0s - loss: 1.3245e-04 - mean_squared_error: 1.3245e-04
Epoch 00036: val_loss improved from 0.00014 to 0.00013, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 1.3200e-04 - mean_squared_error: 1.3200e-04 - val_loss: 1.2704e-04 -
val_mean_squared_error: 1.2704e-04
Epoch 37/50
288/320 [==========================>...] - ETA: 0s - loss: 1.2326e-04 - mean_squared_error: 1.2326e-04
Epoch 00037: val_loss improved from 0.00013 to 0.00012, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 1.2281e-04 - mean_squared_error: 1.2281e-04 - val_loss: 1.1826e-04 -
val_mean_squared_error: 1.1826e-04
Epoch 38/50
288/320 [==========================>...] - ETA: 0s - loss: 1.1476e-04 - mean_squared_error: 1.1476e-04
Epoch 00038: val_loss improved from 0.00012 to 0.00011, saving model to CA3ModelV1_model.hdf5
```

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320/320 [==============================] - 1s 4ms/sample - loss: 1.1434e-04 - mean_squared_error: 1.1434e-04 - val_loss: 1.1016e-04 -
val_mean_squared_error: 1.1016e-04
Epoch 39/50
288/320 [===========================>...] - ETA: 0s - loss: 1.0692e-04 - mean_squared_error: 1.0692e-04
Epoch 00039: val_loss improved from 0.00011 to 0.00010, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 1.0657e-04 - mean_squared_error: 1.0657e-04 - val_loss: 1.0278e-04 -
val_mean_squared_error: 1.0278e-04
Epoch 40/50
288/320 [===========================>...] - ETA: 0s - loss: 9.9802e-05 - mean_squared_error: 9.9802e-05
Epoch 00040: val_loss improved from 0.00010 to 0.00010, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 9.9445e-05 - mean_squared_error: 9.9445e-05 - val_loss: 9.5935e-05 -
val_mean_squared_error: 9.5935e-05
Epoch 41/50
288/320 [===========================>...] - ETA: 0s - loss: 9.3182e-05 - mean_squared_error: 9.3182e-05
Epoch 00041: val_loss improved from 0.00010 to 0.00009, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 9.2879e-05 - mean_squared_error: 9.2879e-05 - val_loss: 8.9689e-05 -
val_mean_squared_error: 8.9689e-05
Epoch 42/50
288/320 [===========================>...] - ETA: 0s - loss: 8.7152e-05 - mean_squared_error: 8.7152e-05
Epoch 00042: val_loss improved from 0.00009 to 0.00008, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 8.6874e-05 - mean_squared_error: 8.6874e-05 - val_loss: 8.3958e-05 -
val_mean_squared_error: 8.3958e-05
Epoch 43/50
288/320 [===========================>...] - ETA: 0s - loss: 8.1653e-05 - mean_squared_error: 8.1653e-05
Epoch 00043: val_loss improved from 0.00008 to 0.00008, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 8.1386e-05 - mean_squared_error: 8.1386e-05 - val_loss: 7.8714e-05 -
val_mean_squared_error: 7.8714e-05
Epoch 44/50
288/320 [===========================>...] - ETA: 0s - loss: 7.6595e-05 - mean_squared_error: 7.6595e-05
Epoch 00044: val_loss improved from 0.00008 to 0.00007, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 7.6336e-05 - mean_squared_error: 7.6336e-05 - val_loss: 7.3886e-05 -
val_mean_squared_error: 7.3886e-05
Epoch 45/50
288/320 [===========================>...] - ETA: 0s - loss: 7.1926e-05 - mean_squared_error: 7.1926e-05
Epoch 00045: val_loss improved from 0.00007 to 0.00007, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 7.1720e-05 - mean_squared_error: 7.1720e-05 - val_loss: 6.9507e-05 -
val_mean_squared_error: 6.9507e-05
Epoch 46/50
288/320 [===========================>...] - ETA: 0s - loss: 6.7707e-05 - mean_squared_error: 6.7707e-05
Epoch 00046: val_loss improved from 0.00007 to 0.00007, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 6.7514e-05 - mean_squared_error: 6.7514e-05 - val_loss: 6.5502e-05 -
val_mean_squared_error: 6.5502e-05
Epoch 47/50
288/320 [===========================>...] - ETA: 0s - loss: 6.3846e-05 - mean_squared_error: 6.3846e-05
Epoch 00047: val_loss improved from 0.00007 to 0.00006, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 6.3656e-05 - mean_squared_error: 6.3656e-05 - val_loss: 6.1813e-05 -
val_mean_squared_error: 6.1813e-05
Epoch 48/50
288/320 [===========================>...] - ETA: 0s - loss: 6.0296e-05 - mean_squared_error: 6.0296e-05
Epoch 00048: val_loss improved from 0.00006 to 0.00006, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 6.0121e-05 - mean_squared_error: 6.0121e-05 - val_loss: 5.8434e-05 -
val_mean_squared_error: 5.8434e-05
Epoch 49/50
288/320 [===========================>...] - ETA: 0s - loss: 5.7046e-05 - mean_squared_error: 5.7046e-05
Epoch 00049: val_loss improved from 0.00006 to 0.00006, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 4ms/sample - loss: 5.6874e-05 - mean_squared_error: 5.6874e-05 - val_loss: 5.5325e-05 -
val_mean_squared_error: 5.5325e-05
Epoch 50/50
288/320 [===========================>...] - ETA: 0s - loss: 5.4013e-05 - mean_squared_error: 5.4013e-05
Epoch 00050: val_loss improved from 0.00006 to 0.00005, saving model to CA3ModelV1_model.hdf5
320/320 [==============================] - 1s 3ms/sample - loss: 5.3871e-05 - mean_squared_error: 5.3871e-05 - val_loss: 5.2471e-05 -
val_mean_squared_error: 5.2471e-05

Training data, shape:  (320, 32, 20, 20, 1)
Decoded Training data, shape:  (320, 32, 20, 20, 1)
Test data, shape:  (80, 32, 20, 20, 1)
Decoded Test data, shape:  (80, 32, 20, 20, 1)
```
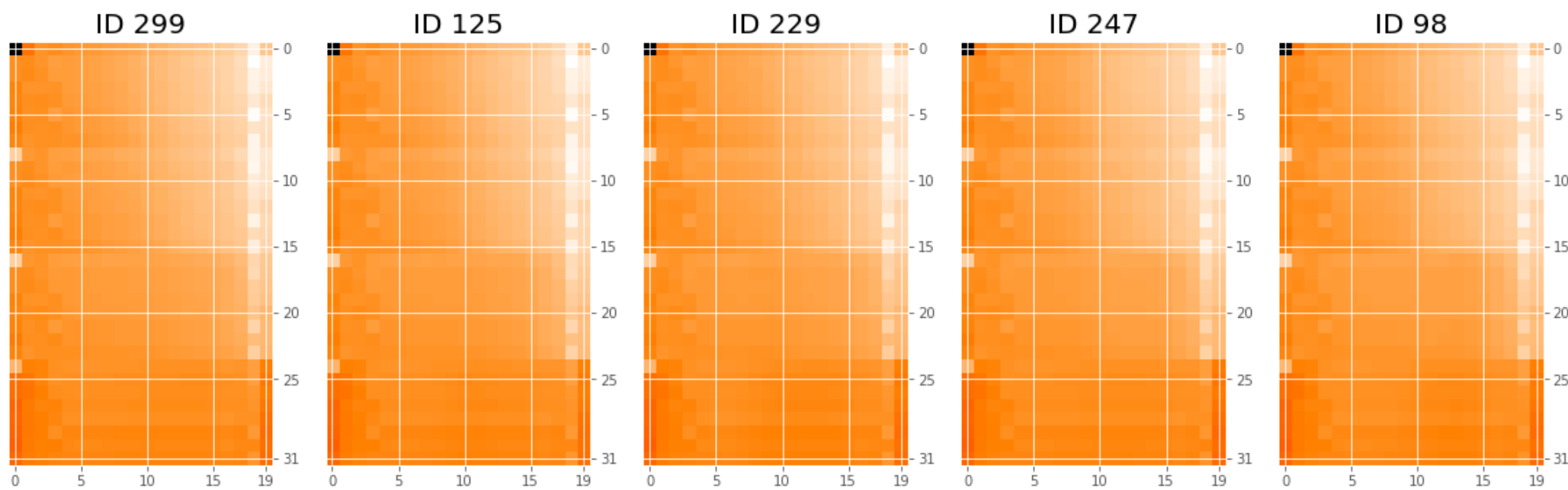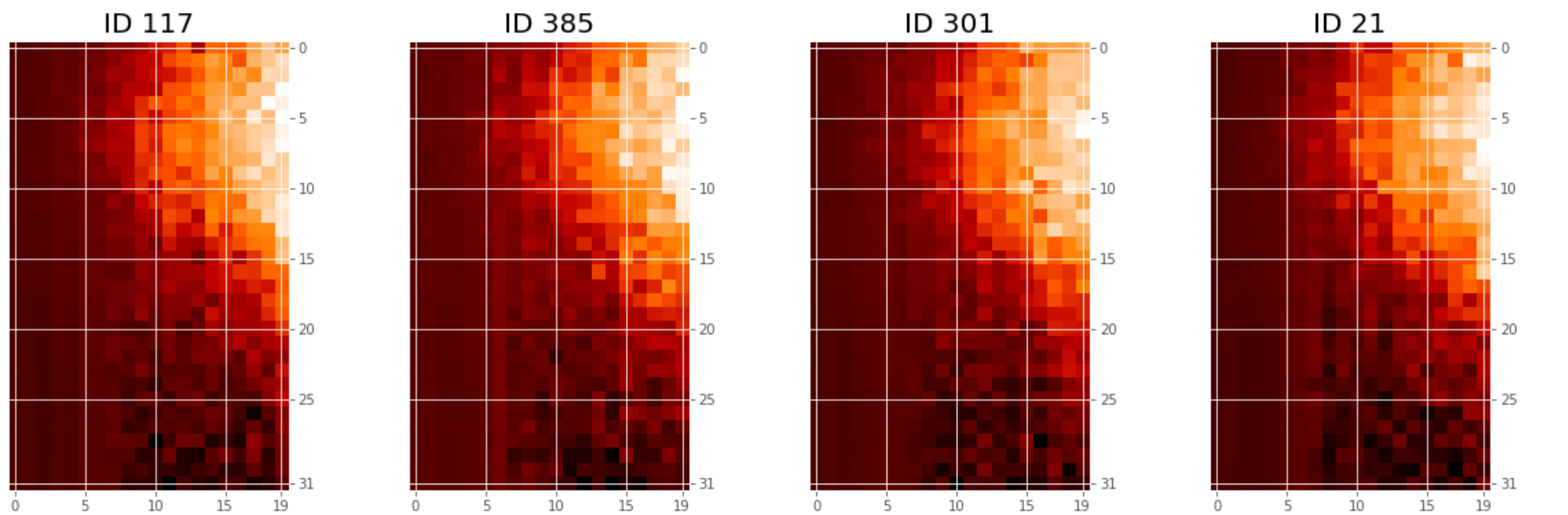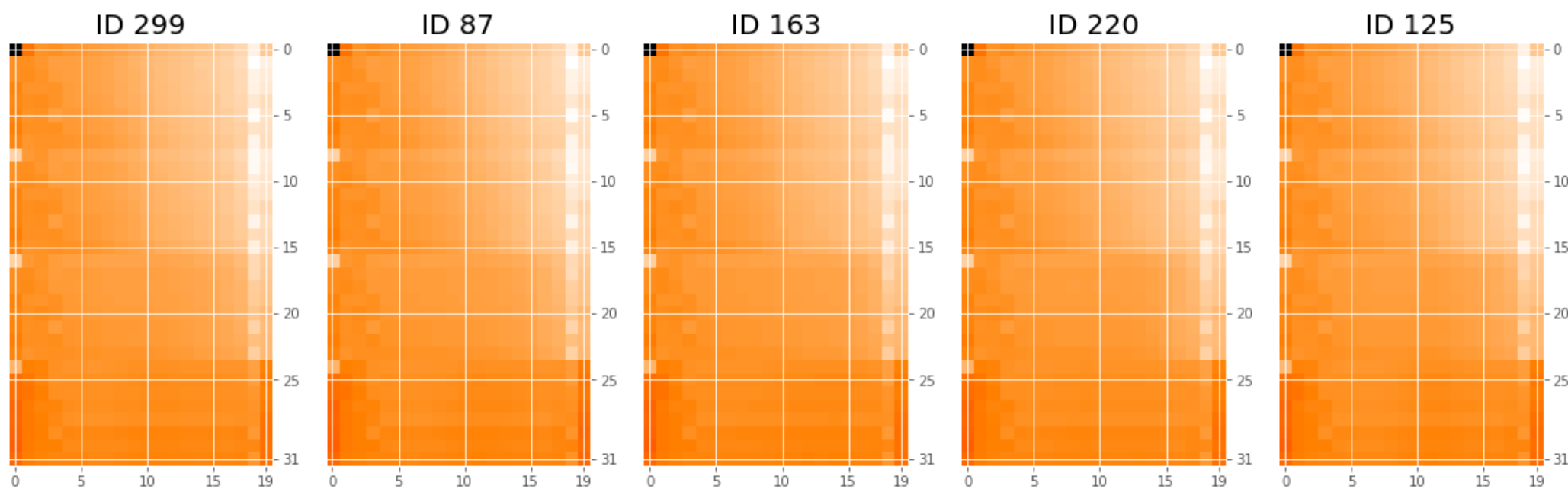

Loss value
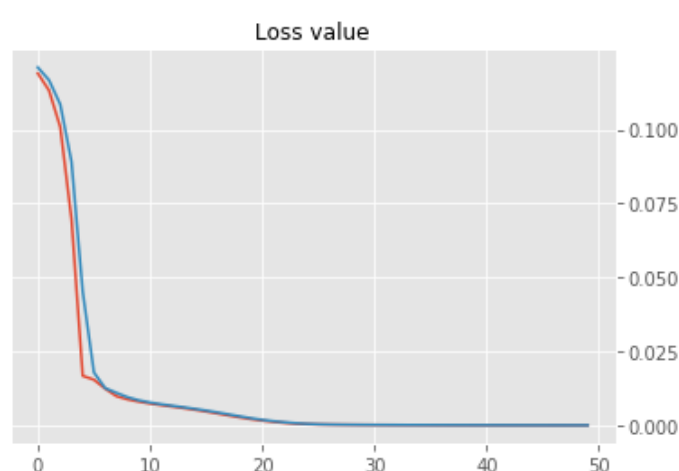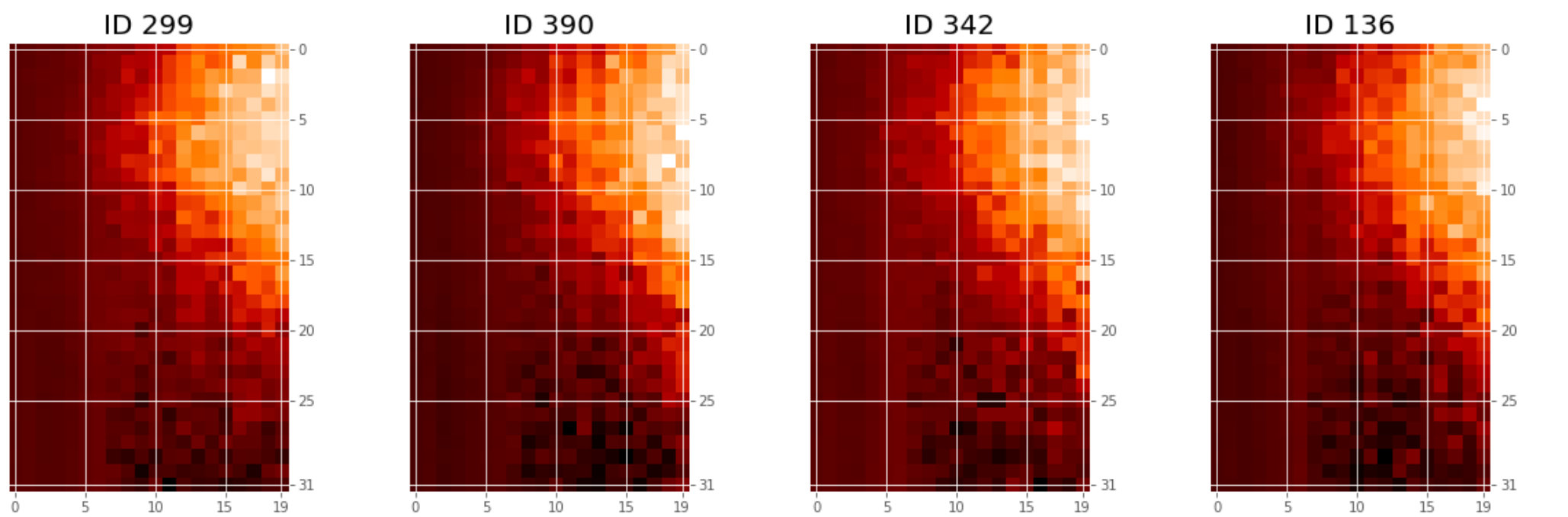
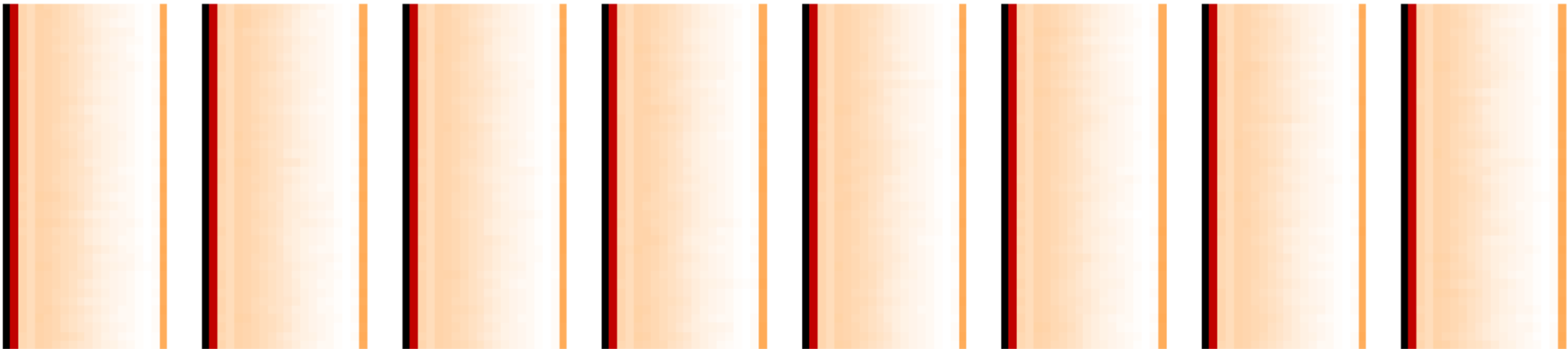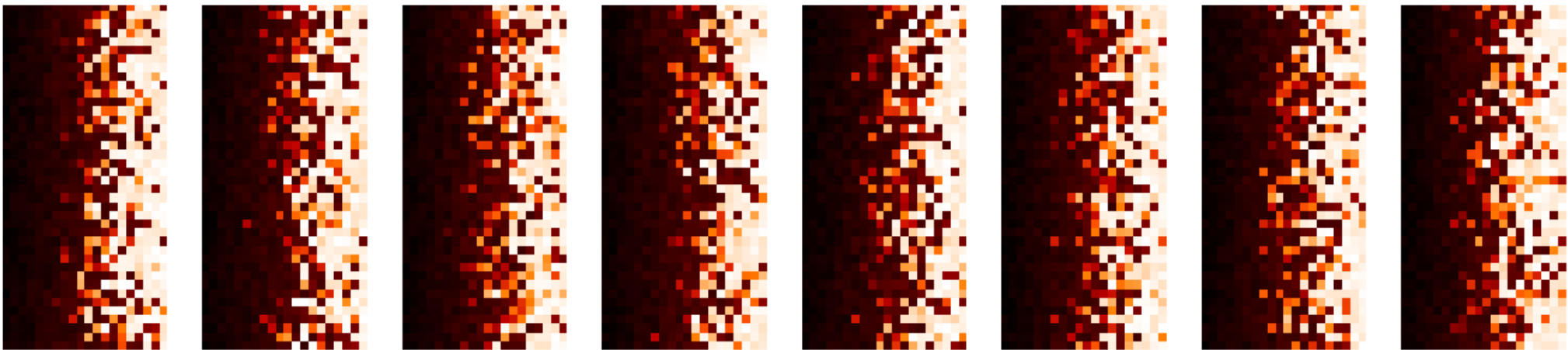Encoded Training Data - Borad Temperature

Test Data - Borad Temperature

Encoded Test Data - Borad Temperature

Training vs Encoded Data - Chip [0, 0] Temperature

Test vs Encoded Data - Chip [0, 0] Temperature