I used:  
X\_jma shape: (85325, 10, 10)

y\_jma shape: (85325, 1)  
  
import tensorflow as tf  
from tensorflow.keras.models import Sequential  
from tensorflow.keras.layers import Conv1D, MaxPooling1D, BatchNormalization, GRU, Dropout, Dense  
from tensorflow.keras.regularizers import l2  
from tensorflow.keras.optimizers import Adam  
from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau  
  
# Define the CNN-GRU model  
def build\_cnn\_gru\_model(input\_shape):  
 model = Sequential()  
  
 # CNN layers  
 model.add(Conv1D(filters=64, kernel\_size=3, activation='relu', input\_shape=input\_shape))  
 model.add(BatchNormalization())  
 model.add(MaxPooling1D(pool\_size=2))  
  
 model.add(Conv1D(filters=128, kernel\_size=3, activation='relu'))  
 model.add(BatchNormalization())  
 model.add(MaxPooling1D(pool\_size=2))  
  
 # GRU layers  
 model.add(GRU(units=256, return\_sequences=True, kernel\_regularizer=l2(0.001)))  
 model.add(Dropout(0.3))  
 model.add(GRU(units=128, return\_sequences=False, kernel\_regularizer=l2(0.001)))  
 model.add(Dropout(0.3))  
  
 # Dense layers  
 model.add(Dense(units=64, activation='relu', kernel\_regularizer=l2(0.001)))  
 model.add(Dropout(0.4))  
 model.add(Dense(units=1, activation='linear')) # Regression output  
  
 # Compile the model with a learning rate scheduler  
 model.compile(optimizer=Adam(learning\_rate=0.0005), loss='mse', metrics=['mae'])  
  
 return model

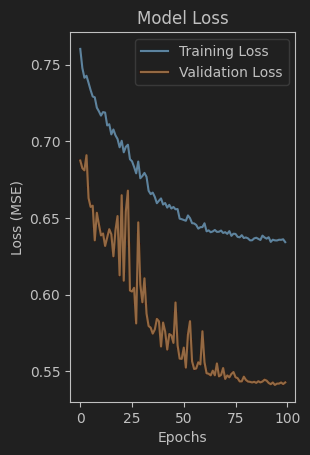
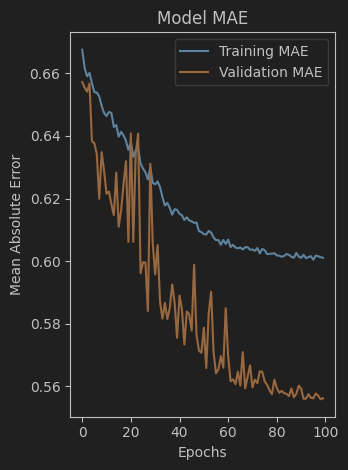
# Build the model  
input\_shape = (10, 10) # Adjust based on your data  
model = build\_cnn\_gru\_model(input\_shape)

# Define Callbacks  
early\_stopping = EarlyStopping(  
 monitor='val\_loss',  
 patience=10, # Stop if no improvement after 10 epochs  
 restore\_best\_weights=True  
)  
reduce\_lr = ReduceLROnPlateau(  
 monitor='val\_loss',  
 factor=0.5, # Reduce learning rate by half  
 patience=5, # After 5 epochs of no improvement  
 min\_lr=1e-6 # Minimum learning rate  
)

# Adjust the input shape to match the new data  
input\_shape = (X\_jma.shape[1], X\_jma.shape[2]) # (10, 10)

# Train the model  
history = model.fit(  
 X\_jma, y\_jma,  
 validation\_split=0.2,  
 epochs=100, # Increased to 100 to allow for more learning  
 batch\_size=128,  
 callbacks=[early\_stopping, reduce\_lr]  
)

I got:  
Training Loss: 0.6129

Training MAE: 0.5832  
  
  
  
Epoch 1/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7603 - mae: 0.6675 - val\_loss: 0.6875 - val\_mae: 0.6572 - lr: 1.2500e-04

Epoch 2/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7479 - mae: 0.6618 - val\_loss: 0.6826 - val\_mae: 0.6555 - lr: 1.2500e-04

Epoch 3/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7415 - mae: 0.6591 - val\_loss: 0.6812 - val\_mae: 0.6541 - lr: 1.2500e-04

Epoch 4/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7428 - mae: 0.6602 - val\_loss: 0.6910 - val\_mae: 0.6567 - lr: 1.2500e-04

Epoch 5/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7382 - mae: 0.6569 - val\_loss: 0.6630 - val\_mae: 0.6383 - lr: 1.2500e-04

Epoch 6/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7334 - mae: 0.6540 - val\_loss: 0.6573 - val\_mae: 0.6377 - lr: 1.2500e-04

Epoch 7/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7293 - mae: 0.6538 - val\_loss: 0.6581 - val\_mae: 0.6342 - lr: 1.2500e-04

Epoch 8/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7288 - mae: 0.6527 - val\_loss: 0.6355 - val\_mae: 0.6199 - lr: 1.2500e-04

Epoch 9/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7220 - mae: 0.6496 - val\_loss: 0.6535 - val\_mae: 0.6348 - lr: 1.2500e-04

Epoch 10/100

534/534 [==============================] - 5s 10ms/step - loss: 0.7196 - mae: 0.6473 - val\_loss: 0.6459 - val\_mae: 0.6288 - lr: 1.2500e-04

Epoch 11/100

534/534 [==============================] - 6s 11ms/step - loss: 0.7168 - mae: 0.6464 - val\_loss: 0.6387 - val\_mae: 0.6216 - lr: 1.2500e-04

Epoch 12/100

534/534 [==============================] - 6s 12ms/step - loss: 0.7191 - mae: 0.6477 - val\_loss: 0.6400 - val\_mae: 0.6222 - lr: 1.2500e-04

Epoch 13/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7188 - mae: 0.6474 - val\_loss: 0.6318 - val\_mae: 0.6182 - lr: 1.2500e-04

Epoch 14/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7104 - mae: 0.6429 - val\_loss: 0.6373 - val\_mae: 0.6147 - lr: 1.2500e-04

Epoch 15/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7112 - mae: 0.6435 - val\_loss: 0.6428 - val\_mae: 0.6283 - lr: 1.2500e-04

Epoch 16/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7046 - mae: 0.6398 - val\_loss: 0.6394 - val\_mae: 0.6110 - lr: 1.2500e-04

Epoch 17/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7078 - mae: 0.6413 - val\_loss: 0.6251 - val\_mae: 0.6162 - lr: 1.2500e-04

Epoch 18/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7040 - mae: 0.6402 - val\_loss: 0.6421 - val\_mae: 0.6246 - lr: 1.2500e-04

Epoch 19/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7016 - mae: 0.6384 - val\_loss: 0.6513 - val\_mae: 0.6319 - lr: 1.2500e-04

Epoch 20/100

534/534 [==============================] - 7s 12ms/step - loss: 0.6962 - mae: 0.6355 - val\_loss: 0.6127 - val\_mae: 0.6061 - lr: 1.2500e-04

Epoch 21/100

534/534 [==============================] - 7s 12ms/step - loss: 0.7004 - mae: 0.6380 - val\_loss: 0.6649 - val\_mae: 0.6408 - lr: 1.2500e-04

Epoch 22/100

534/534 [==============================] - 7s 12ms/step - loss: 0.6929 - mae: 0.6334 - val\_loss: 0.6092 - val\_mae: 0.6062 - lr: 1.2500e-04

Epoch 23/100

534/534 [==============================] - 6s 11ms/step - loss: 0.6965 - mae: 0.6354 - val\_loss: 0.6544 - val\_mae: 0.6345 - lr: 1.2500e-04

Epoch 24/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6979 - mae: 0.6361 - val\_loss: 0.6679 - val\_mae: 0.6408 - lr: 1.2500e-04

Epoch 25/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6884 - mae: 0.6312 - val\_loss: 0.6028 - val\_mae: 0.5961 - lr: 1.2500e-04

Epoch 26/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6870 - mae: 0.6296 - val\_loss: 0.6021 - val\_mae: 0.5997 - lr: 1.2500e-04

Epoch 27/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6834 - mae: 0.6284 - val\_loss: 0.6045 - val\_mae: 0.5996 - lr: 1.2500e-04

Epoch 28/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6792 - mae: 0.6261 - val\_loss: 0.5813 - val\_mae: 0.5841 - lr: 1.2500e-04

Epoch 29/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6869 - mae: 0.6300 - val\_loss: 0.6472 - val\_mae: 0.6311 - lr: 1.2500e-04

Epoch 30/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6760 - mae: 0.6250 - val\_loss: 0.6067 - val\_mae: 0.6057 - lr: 1.2500e-04

Epoch 31/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6775 - mae: 0.6246 - val\_loss: 0.5951 - val\_mae: 0.5958 - lr: 1.2500e-04

Epoch 32/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6795 - mae: 0.6254 - val\_loss: 0.6107 - val\_mae: 0.6051 - lr: 1.2500e-04

Epoch 33/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6769 - mae: 0.6236 - val\_loss: 0.5878 - val\_mae: 0.5870 - lr: 1.2500e-04

Epoch 34/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6679 - mae: 0.6204 - val\_loss: 0.5797 - val\_mae: 0.5816 - lr: 6.2500e-05

Epoch 35/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6656 - mae: 0.6178 - val\_loss: 0.5785 - val\_mae: 0.5866 - lr: 6.2500e-05

Epoch 36/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6666 - mae: 0.6186 - val\_loss: 0.5747 - val\_mae: 0.5815 - lr: 6.2500e-05

Epoch 37/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6638 - mae: 0.6170 - val\_loss: 0.5774 - val\_mae: 0.5850 - lr: 6.2500e-05

Epoch 38/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6597 - mae: 0.6148 - val\_loss: 0.5843 - val\_mae: 0.5925 - lr: 6.2500e-05

Epoch 39/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6613 - mae: 0.6166 - val\_loss: 0.5827 - val\_mae: 0.5866 - lr: 6.2500e-05

Epoch 40/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6628 - mae: 0.6164 - val\_loss: 0.5663 - val\_mae: 0.5755 - lr: 6.2500e-05

Epoch 41/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6589 - mae: 0.6151 - val\_loss: 0.5819 - val\_mae: 0.5890 - lr: 6.2500e-05

Epoch 42/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6598 - mae: 0.6146 - val\_loss: 0.5760 - val\_mae: 0.5846 - lr: 6.2500e-05

Epoch 43/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6569 - mae: 0.6132 - val\_loss: 0.5643 - val\_mae: 0.5734 - lr: 6.2500e-05

Epoch 44/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6586 - mae: 0.6140 - val\_loss: 0.5744 - val\_mae: 0.5839 - lr: 6.2500e-05

Epoch 45/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6563 - mae: 0.6130 - val\_loss: 0.5736 - val\_mae: 0.5830 - lr: 6.2500e-05

Epoch 46/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6573 - mae: 0.6127 - val\_loss: 0.5686 - val\_mae: 0.5778 - lr: 6.2500e-05

Epoch 47/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6558 - mae: 0.6122 - val\_loss: 0.5950 - val\_mae: 0.5988 - lr: 6.2500e-05

Epoch 48/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6559 - mae: 0.6123 - val\_loss: 0.5671 - val\_mae: 0.5764 - lr: 6.2500e-05

Epoch 49/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6497 - mae: 0.6096 - val\_loss: 0.5584 - val\_mae: 0.5714 - lr: 3.1250e-05

Epoch 50/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6493 - mae: 0.6093 - val\_loss: 0.5582 - val\_mae: 0.5707 - lr: 3.1250e-05

Epoch 51/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6488 - mae: 0.6086 - val\_loss: 0.5655 - val\_mae: 0.5787 - lr: 3.1250e-05

Epoch 52/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6483 - mae: 0.6085 - val\_loss: 0.5525 - val\_mae: 0.5658 - lr: 3.1250e-05

Epoch 53/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6517 - mae: 0.6097 - val\_loss: 0.5739 - val\_mae: 0.5832 - lr: 3.1250e-05

Epoch 54/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6500 - mae: 0.6091 - val\_loss: 0.5828 - val\_mae: 0.5902 - lr: 3.1250e-05

Epoch 55/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6467 - mae: 0.6076 - val\_loss: 0.5566 - val\_mae: 0.5710 - lr: 3.1250e-05

Epoch 56/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6465 - mae: 0.6067 - val\_loss: 0.5516 - val\_mae: 0.5642 - lr: 3.1250e-05

Epoch 57/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6456 - mae: 0.6067 - val\_loss: 0.5520 - val\_mae: 0.5654 - lr: 3.1250e-05

Epoch 58/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6431 - mae: 0.6052 - val\_loss: 0.5560 - val\_mae: 0.5697 - lr: 3.1250e-05

Epoch 59/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6441 - mae: 0.6068 - val\_loss: 0.5546 - val\_mae: 0.5660 - lr: 3.1250e-05

Epoch 60/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6441 - mae: 0.6055 - val\_loss: 0.5762 - val\_mae: 0.5850 - lr: 3.1250e-05

Epoch 61/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6466 - mae: 0.6069 - val\_loss: 0.5560 - val\_mae: 0.5696 - lr: 3.1250e-05

Epoch 62/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6414 - mae: 0.6045 - val\_loss: 0.5489 - val\_mae: 0.5616 - lr: 1.5625e-05

Epoch 63/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6420 - mae: 0.6052 - val\_loss: 0.5485 - val\_mae: 0.5622 - lr: 1.5625e-05

Epoch 64/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6408 - mae: 0.6043 - val\_loss: 0.5475 - val\_mae: 0.5607 - lr: 1.5625e-05

Epoch 65/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6413 - mae: 0.6041 - val\_loss: 0.5505 - val\_mae: 0.5646 - lr: 1.5625e-05

Epoch 66/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6423 - mae: 0.6044 - val\_loss: 0.5475 - val\_mae: 0.5603 - lr: 1.5625e-05

Epoch 67/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6410 - mae: 0.6037 - val\_loss: 0.5552 - val\_mae: 0.5709 - lr: 1.5625e-05

Epoch 68/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6411 - mae: 0.6044 - val\_loss: 0.5468 - val\_mae: 0.5594 - lr: 1.5625e-05

Epoch 69/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6419 - mae: 0.6045 - val\_loss: 0.5477 - val\_mae: 0.5630 - lr: 1.5625e-05

Epoch 70/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6403 - mae: 0.6037 - val\_loss: 0.5522 - val\_mae: 0.5667 - lr: 1.5625e-05

Epoch 71/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6409 - mae: 0.6037 - val\_loss: 0.5451 - val\_mae: 0.5597 - lr: 1.5625e-05

Epoch 72/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6397 - mae: 0.6033 - val\_loss: 0.5474 - val\_mae: 0.5621 - lr: 1.5625e-05

Epoch 73/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6415 - mae: 0.6042 - val\_loss: 0.5462 - val\_mae: 0.5610 - lr: 1.5625e-05

Epoch 74/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6384 - mae: 0.6025 - val\_loss: 0.5484 - val\_mae: 0.5647 - lr: 1.5625e-05

Epoch 75/100

534/534 [==============================] - 5s 9ms/step - loss: 0.6398 - mae: 0.6039 - val\_loss: 0.5496 - val\_mae: 0.5647 - lr: 1.5625e-05

Epoch 76/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6397 - mae: 0.6035 - val\_loss: 0.5462 - val\_mae: 0.5616 - lr: 1.5625e-05

Epoch 77/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6378 - mae: 0.6023 - val\_loss: 0.5456 - val\_mae: 0.5605 - lr: 7.8125e-06

Epoch 78/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6375 - mae: 0.6024 - val\_loss: 0.5435 - val\_mae: 0.5588 - lr: 7.8125e-06

Epoch 79/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6389 - mae: 0.6024 - val\_loss: 0.5436 - val\_mae: 0.5575 - lr: 7.8125e-06

Epoch 80/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6370 - mae: 0.6025 - val\_loss: 0.5466 - val\_mae: 0.5621 - lr: 7.8125e-06

Epoch 81/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6374 - mae: 0.6018 - val\_loss: 0.5445 - val\_mae: 0.5595 - lr: 7.8125e-06

Epoch 82/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6368 - mae: 0.6017 - val\_loss: 0.5434 - val\_mae: 0.5579 - lr: 7.8125e-06

Epoch 83/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6355 - mae: 0.6014 - val\_loss: 0.5432 - val\_mae: 0.5585 - lr: 7.8125e-06

Epoch 84/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6355 - mae: 0.6017 - val\_loss: 0.5429 - val\_mae: 0.5578 - lr: 7.8125e-06

Epoch 85/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6368 - mae: 0.6023 - val\_loss: 0.5432 - val\_mae: 0.5576 - lr: 7.8125e-06

Epoch 86/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6372 - mae: 0.6020 - val\_loss: 0.5426 - val\_mae: 0.5569 - lr: 7.8125e-06

Epoch 87/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6365 - mae: 0.6014 - val\_loss: 0.5436 - val\_mae: 0.5593 - lr: 7.8125e-06

Epoch 88/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6357 - mae: 0.6011 - val\_loss: 0.5429 - val\_mae: 0.5565 - lr: 7.8125e-06

Epoch 89/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6386 - mae: 0.6026 - val\_loss: 0.5434 - val\_mae: 0.5575 - lr: 7.8125e-06

Epoch 90/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6374 - mae: 0.6015 - val\_loss: 0.5446 - val\_mae: 0.5602 - lr: 7.8125e-06

Epoch 91/100

534/534 [==============================] - 6s 10ms/step - loss: 0.6366 - mae: 0.6010 - val\_loss: 0.5440 - val\_mae: 0.5592 - lr: 7.8125e-06

Epoch 92/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6375 - mae: 0.6020 - val\_loss: 0.5425 - val\_mae: 0.5560 - lr: 3.9063e-06

Epoch 93/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6345 - mae: 0.6009 - val\_loss: 0.5417 - val\_mae: 0.5560 - lr: 3.9063e-06

Epoch 94/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6359 - mae: 0.6013 - val\_loss: 0.5428 - val\_mae: 0.5575 - lr: 3.9063e-06

Epoch 95/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6355 - mae: 0.6016 - val\_loss: 0.5412 - val\_mae: 0.5563 - lr: 3.9063e-06

Epoch 96/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6354 - mae: 0.6005 - val\_loss: 0.5421 - val\_mae: 0.5562 - lr: 3.9063e-06

Epoch 97/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6359 - mae: 0.6018 - val\_loss: 0.5421 - val\_mae: 0.5577 - lr: 3.9063e-06

Epoch 98/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6358 - mae: 0.6015 - val\_loss: 0.5428 - val\_mae: 0.5570 - lr: 3.9063e-06

Epoch 99/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6362 - mae: 0.6012 - val\_loss: 0.5418 - val\_mae: 0.5559 - lr: 3.9063e-06

Epoch 100/100

534/534 [==============================] - 5s 10ms/step - loss: 0.6343 - mae: 0.6011 - val\_loss: 0.5428 - val\_mae: 0.5562 - lr: 3.9063e-06