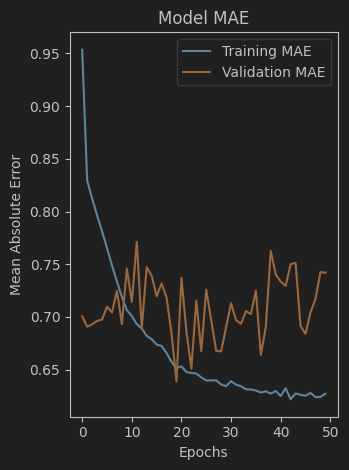
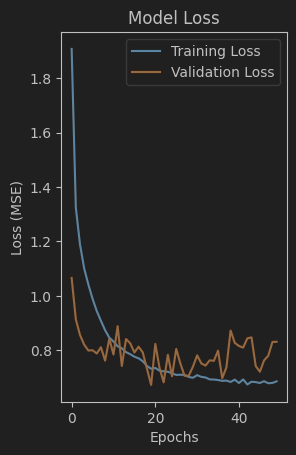
I used:  
X\_jma shape: (85325, 10, 10)

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  
 model.compile(optimizer=Adam(learning\_rate=0.0005), loss='mse', metrics=['mae'])  
  
 return model

# 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=50,  
 batch\_size=64  
)

I got:  
  
Training Loss: 0.8308

Training MAE: 0.7290  
  


Epoch 1/50

1067/1067 [==============================] - 11s 8ms/step - loss: 1.9079 - mae: 0.9533 - val\_loss: 1.0658 - val\_mae: 0.7006

Epoch 2/50

1067/1067 [==============================] - 8s 8ms/step - loss: 1.3240 - mae: 0.8295 - val\_loss: 0.9137 - val\_mae: 0.6909

Epoch 3/50

1067/1067 [==============================] - 8s 8ms/step - loss: 1.1887 - mae: 0.8124 - val\_loss: 0.8560 - val\_mae: 0.6930

Epoch 4/50

1067/1067 [==============================] - 8s 8ms/step - loss: 1.1006 - mae: 0.7965 - val\_loss: 0.8207 - val\_mae: 0.6962

Epoch 5/50

1067/1067 [==============================] - 9s 8ms/step - loss: 1.0414 - mae: 0.7813 - val\_loss: 0.7991 - val\_mae: 0.6975

Epoch 6/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.9893 - mae: 0.7654 - val\_loss: 0.8002 - val\_mae: 0.7097

Epoch 7/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.9445 - mae: 0.7489 - val\_loss: 0.7881 - val\_mae: 0.7042

Epoch 8/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.9083 - mae: 0.7337 - val\_loss: 0.8112 - val\_mae: 0.7249

Epoch 9/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.8738 - mae: 0.7192 - val\_loss: 0.7618 - val\_mae: 0.6934

Epoch 10/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.8467 - mae: 0.7066 - val\_loss: 0.8425 - val\_mae: 0.7460

Epoch 11/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.8320 - mae: 0.7008 - val\_loss: 0.7845 - val\_mae: 0.7144

Epoch 12/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.8147 - mae: 0.6932 - val\_loss: 0.8887 - val\_mae: 0.7712

Epoch 13/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.8073 - mae: 0.6891 - val\_loss: 0.7423 - val\_mae: 0.6897

Epoch 14/50

1067/1067 [==============================] - 9s 9ms/step - loss: 0.7931 - mae: 0.6822 - val\_loss: 0.8414 - val\_mae: 0.7473

Epoch 15/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7857 - mae: 0.6790 - val\_loss: 0.8258 - val\_mae: 0.7391

Epoch 16/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7764 - mae: 0.6738 - val\_loss: 0.7919 - val\_mae: 0.7197

Epoch 17/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7707 - mae: 0.6725 - val\_loss: 0.8132 - val\_mae: 0.7318

Epoch 18/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7598 - mae: 0.6659 - val\_loss: 0.7922 - val\_mae: 0.7185

Epoch 19/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7426 - mae: 0.6574 - val\_loss: 0.7326 - val\_mae: 0.6846

Epoch 20/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7321 - mae: 0.6516 - val\_loss: 0.6726 - val\_mae: 0.6389

Epoch 21/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.7350 - mae: 0.6532 - val\_loss: 0.8233 - val\_mae: 0.7370

Epoch 22/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7251 - mae: 0.6479 - val\_loss: 0.7360 - val\_mae: 0.6867

Epoch 23/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.7226 - mae: 0.6470 - val\_loss: 0.6821 - val\_mae: 0.6511

Epoch 24/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7213 - mae: 0.6464 - val\_loss: 0.7833 - val\_mae: 0.7155

Epoch 25/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.7152 - mae: 0.6427 - val\_loss: 0.7043 - val\_mae: 0.6676

Epoch 26/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.7094 - mae: 0.6398 - val\_loss: 0.8051 - val\_mae: 0.7260

Epoch 27/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7102 - mae: 0.6399 - val\_loss: 0.7509 - val\_mae: 0.6969

Epoch 28/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7094 - mae: 0.6399 - val\_loss: 0.7061 - val\_mae: 0.6680

Epoch 29/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.7018 - mae: 0.6359 - val\_loss: 0.7067 - val\_mae: 0.6674

Epoch 30/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6990 - mae: 0.6343 - val\_loss: 0.7398 - val\_mae: 0.6904

Epoch 31/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7085 - mae: 0.6391 - val\_loss: 0.7813 - val\_mae: 0.7130

Epoch 32/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7022 - mae: 0.6359 - val\_loss: 0.7517 - val\_mae: 0.6970

Epoch 33/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.7000 - mae: 0.6343 - val\_loss: 0.7437 - val\_mae: 0.6935

Epoch 34/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6930 - mae: 0.6314 - val\_loss: 0.7630 - val\_mae: 0.7055

Epoch 35/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6924 - mae: 0.6313 - val\_loss: 0.7612 - val\_mae: 0.7027

Epoch 36/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6907 - mae: 0.6303 - val\_loss: 0.7986 - val\_mae: 0.7250

Epoch 37/50

1067/1067 [==============================] - 9s 8ms/step - loss: 0.6875 - mae: 0.6283 - val\_loss: 0.6973 - val\_mae: 0.6641

Epoch 38/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6885 - mae: 0.6296 - val\_loss: 0.7373 - val\_mae: 0.6905

Epoch 39/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6835 - mae: 0.6273 - val\_loss: 0.8726 - val\_mae: 0.7627

Epoch 40/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6921 - mae: 0.6299 - val\_loss: 0.8274 - val\_mae: 0.7403

Epoch 41/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6795 - mae: 0.6251 - val\_loss: 0.8158 - val\_mae: 0.7337

Epoch 42/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6930 - mae: 0.6324 - val\_loss: 0.8097 - val\_mae: 0.7295

Epoch 43/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6744 - mae: 0.6220 - val\_loss: 0.8439 - val\_mae: 0.7501

Epoch 44/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6843 - mae: 0.6274 - val\_loss: 0.8474 - val\_mae: 0.7513

Epoch 45/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6830 - mae: 0.6262 - val\_loss: 0.7424 - val\_mae: 0.6914

Epoch 46/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6797 - mae: 0.6253 - val\_loss: 0.7212 - val\_mae: 0.6840

Epoch 47/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6863 - mae: 0.6280 - val\_loss: 0.7629 - val\_mae: 0.7044

Epoch 48/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6788 - mae: 0.6241 - val\_loss: 0.7797 - val\_mae: 0.7170

Epoch 49/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6799 - mae: 0.6241 - val\_loss: 0.8305 - val\_mae: 0.7425

Epoch 50/50

1067/1067 [==============================] - 8s 8ms/step - loss: 0.6858 - mae: 0.6271 - val\_loss: 0.8313 - val\_mae: 0.7421