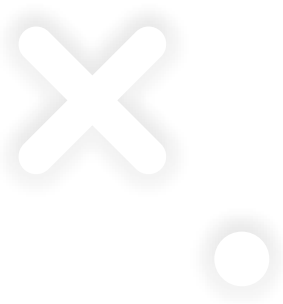




Challenge Report

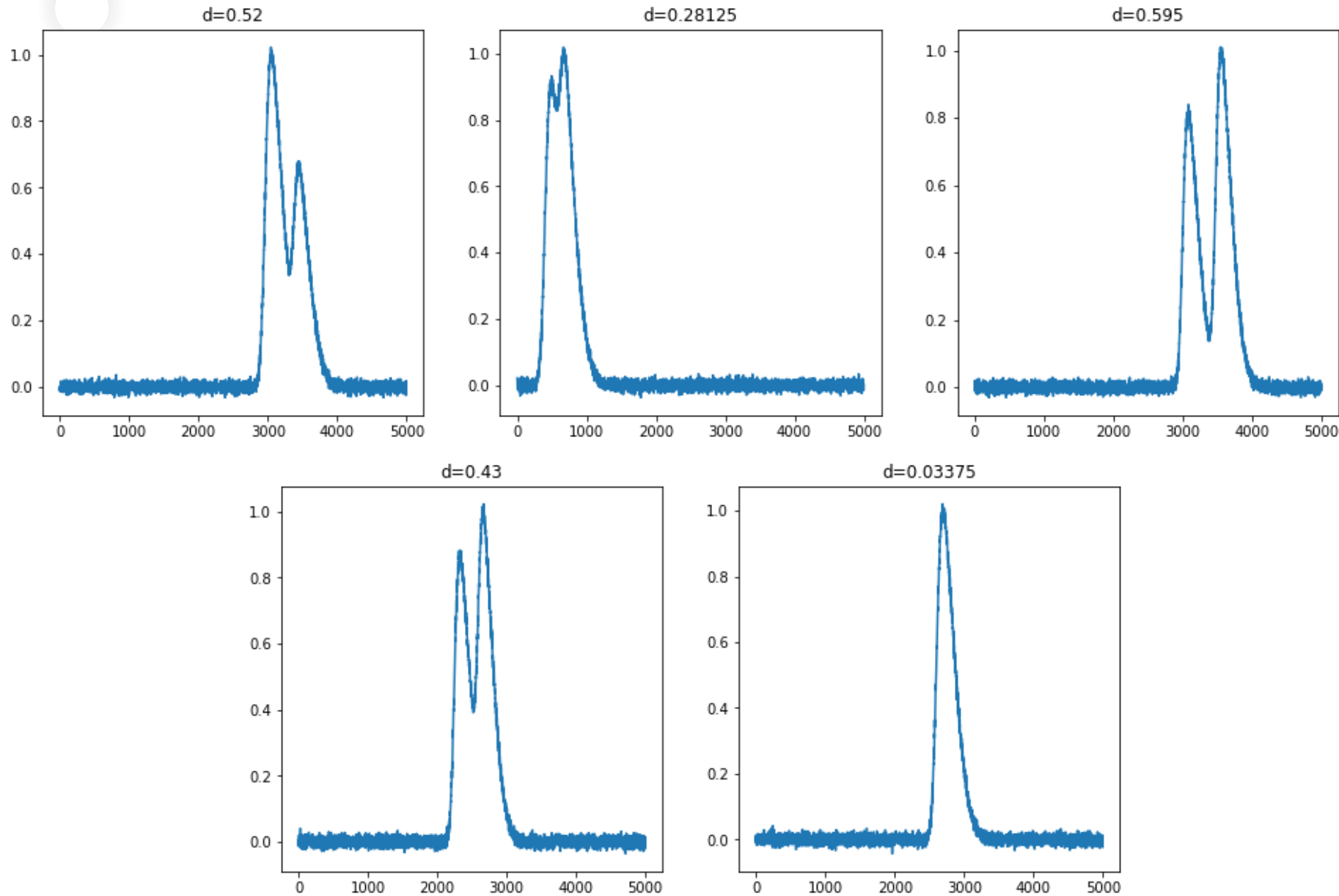
June 2022

Pedro Costa

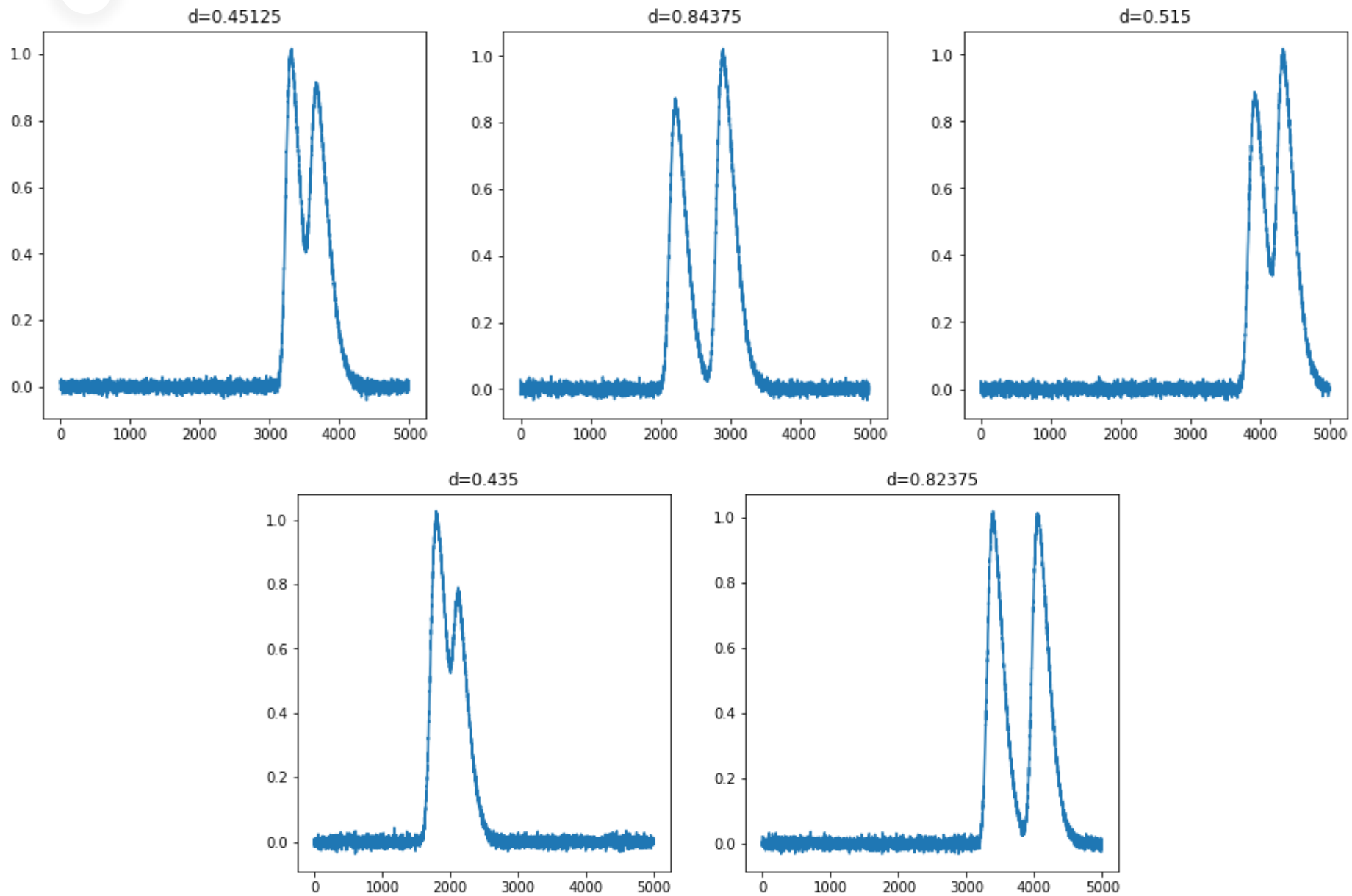




Data Visualization



Data Scaling/Normalization



Model 1: Architecture

```
inputs = Input(shape=(num_bins,), name = "input_layer")
x = Reshape((-1, 1))(inputs)
x = Conv1D(64, kernel_size=int(num_bins), activation="sigmoid", padding="valid")(x)
x = Flatten()(x)
x = Dense(64, activation="relu")(x)
x = Dropout(0.1)(x)
x = Dense(64, activation="relu")(x)
x = Dropout(0.1)(x)
outputs = Dense(1, activation="sigmoid")(x)
model = tf.keras.Model(inputs, outputs)
```

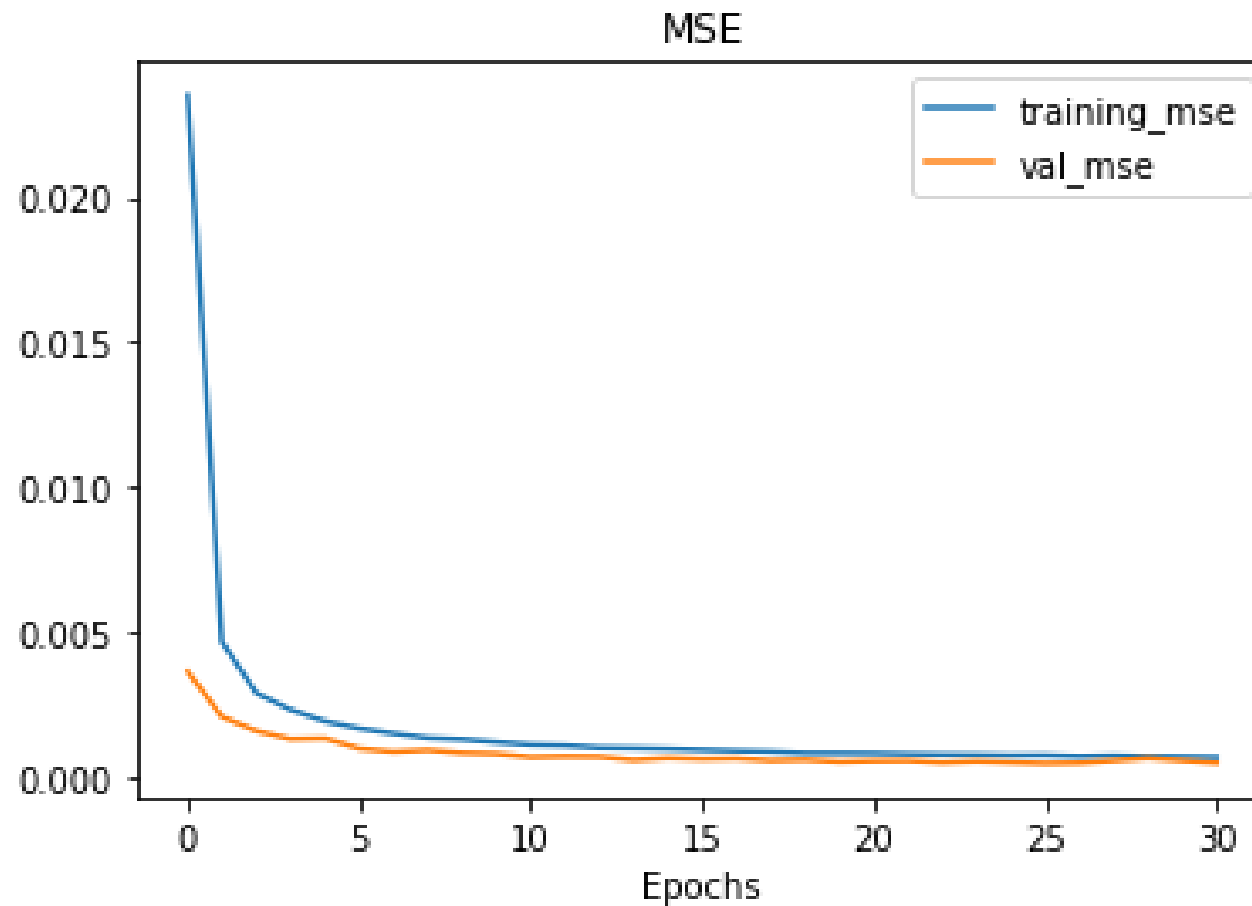
Layer (type)	Output Shape	Param #
input_layer (InputLayer)	[(None, 5000)]	0
reshape_1 (Reshape)	(None, 5000, 1)	0
conv1d_1 (Conv1D)	(None, 1, 64)	320064
flatten_1 (Flatten)	(None, 64)	0
dense_3 (Dense)	(None, 64)	4160
dropout_2 (Dropout)	(None, 64)	0
dense_4 (Dense)	(None, 64)	4160
dropout_3 (Dropout)	(None, 64)	0
dense_5 (Dense)	(None, 1)	65

=====
Total params: 328,449
Trainable params: 328,449
Non-trainable params: 0

Model 1: Training

```
Epoch 16/50
125/125 [=====] - 1s 6ms/step - loss: 9.3974e-04 - mse: 9.3974e-04 - val_loss: 6.2268e-04 - val_mse: 6.2268e-04
Epoch 17/50
125/125 [=====] - 1s 6ms/step - loss: 9.0578e-04 - mse: 9.0578e-04 - val_loss: 6.4066e-04 - val_mse: 6.4066e-04
Epoch 18/50
125/125 [=====] - 1s 6ms/step - loss: 8.8086e-04 - mse: 8.8086e-04 - val_loss: 5.7135e-04 - val_mse: 5.7135e-04
Epoch 19/50
125/125 [=====] - 1s 6ms/step - loss: 8.2679e-04 - mse: 8.2679e-04 - val_loss: 5.9665e-04 - val_mse: 5.9665e-04
Epoch 20/50
125/125 [=====] - 1s 6ms/step - loss: 8.2393e-04 - mse: 8.2393e-04 - val_loss: 5.2823e-04 - val_mse: 5.2823e-04
Epoch 21/50
125/125 [=====] - 1s 6ms/step - loss: 8.1554e-04 - mse: 8.1554e-04 - val_loss: 5.5822e-04 - val_mse: 5.5822e-04
Epoch 22/50
125/125 [=====] - 1s 6ms/step - loss: 7.9181e-04 - mse: 7.9181e-04 - val_loss: 5.6631e-04 - val_mse: 5.6631e-04
Epoch 23/50
125/125 [=====] - 1s 6ms/step - loss: 7.7655e-04 - mse: 7.7655e-04 - val_loss: 5.0400e-04 - val_mse: 5.0400e-04
Epoch 24/50
125/125 [=====] - 1s 6ms/step - loss: 7.6969e-04 - mse: 7.6969e-04 - val_loss: 5.4463e-04 - val_mse: 5.4463e-04
Epoch 25/50
125/125 [=====] - 1s 6ms/step - loss: 7.5232e-04 - mse: 7.5232e-04 - val_loss: 5.0777e-04 - val_mse: 5.0777e-04
Epoch 26/50
125/125 [=====] - 1s 6ms/step - loss: 7.5709e-04 - mse: 7.5709e-04 - val_loss: 4.7101e-04 - val_mse: 4.7101e-04
Epoch 27/50
125/125 [=====] - 1s 6ms/step - loss: 7.1955e-04 - mse: 7.1955e-04 - val_loss: 4.8802e-04 - val_mse: 4.8802e-04
Epoch 28/50
125/125 [=====] - 1s 6ms/step - loss: 7.4209e-04 - mse: 7.4209e-04 - val_loss: 5.6896e-04 - val_mse: 5.6896e-04
Epoch 29/50
125/125 [=====] - 1s 6ms/step - loss: 7.1695e-04 - mse: 7.1695e-04 - val_loss: 6.5668e-04 - val_mse: 6.5668e-04
Epoch 30/50
125/125 [=====] - 1s 6ms/step - loss: 7.0317e-04 - mse: 7.0317e-04 - val_loss: 5.7131e-04 - val_mse: 5.7131e-04
Epoch 31/50
116/125 [=====>...] - ETA: 0s - loss: 6.9215e-04 - mse: 6.9215e-04 Restoring model weights from the end of the best epoch: 26.
125/125 [=====] - 1s 6ms/step - loss: 6.8900e-04 - mse: 6.8900e-04 - val_loss: 4.9079e-04 - val_mse: 4.9079e-04
Epoch 31: early stopping
```

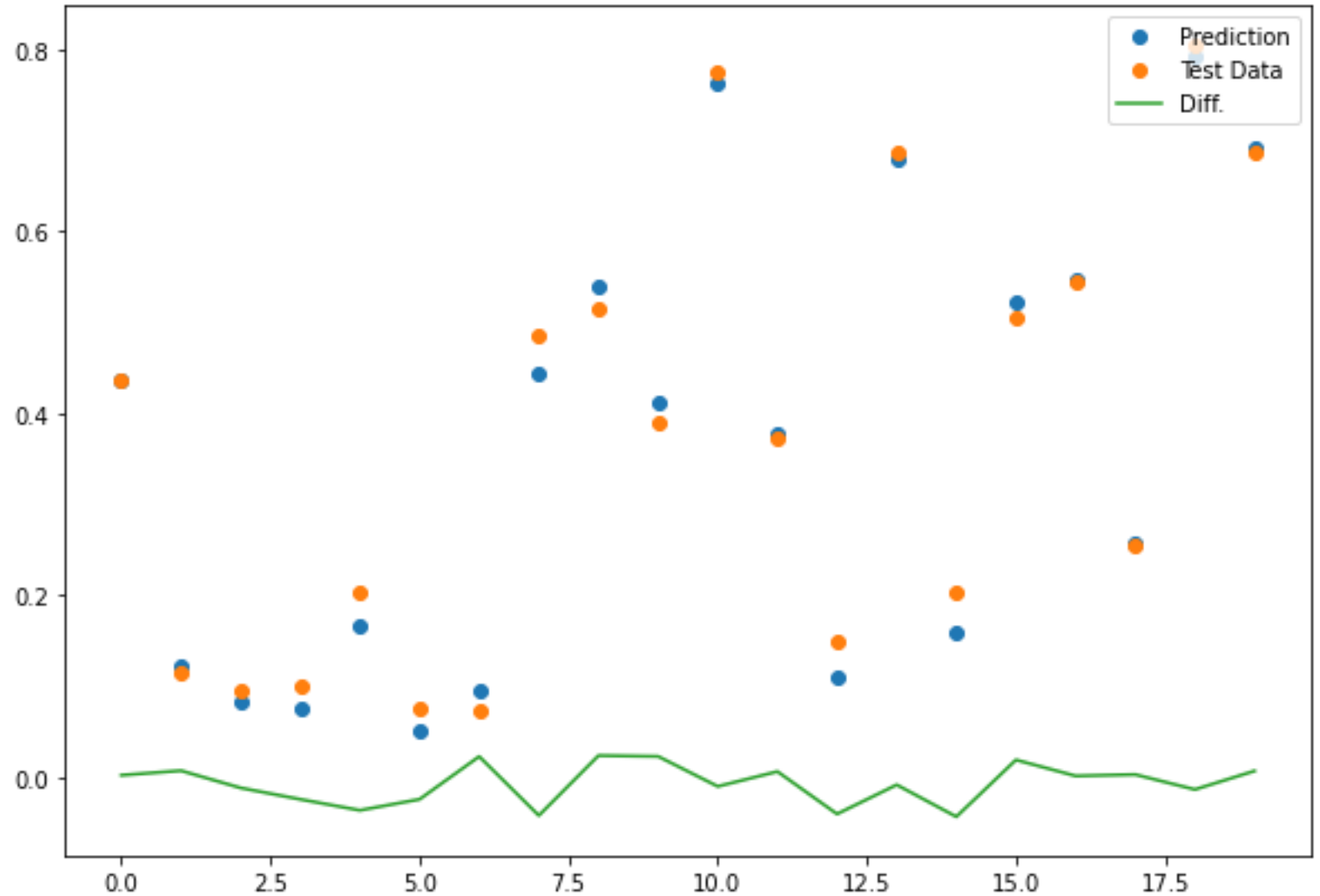
Model 1: Loss Curves



Model 1 Performance:

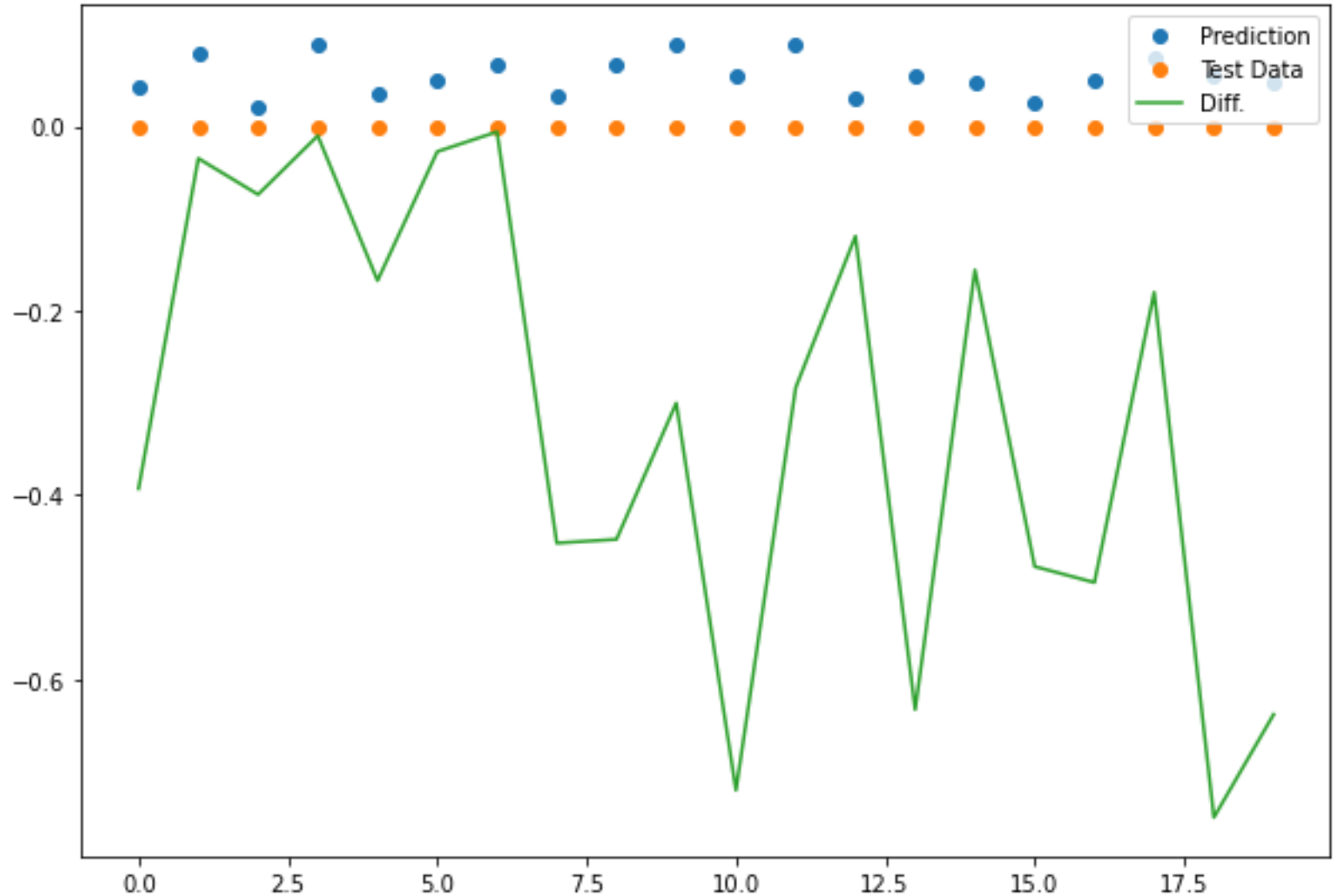
2x Data

Metric (Training)	Value
MSE	7.57e-4
RMSE	2.75e-2
Metric (Validation)	Value
MSE	4,71e-4
RMSE	2.17e-2
Metric (Test)	Value
MSE	4,90e-4
RMSE	2.21e-2
R ² -score	0.994



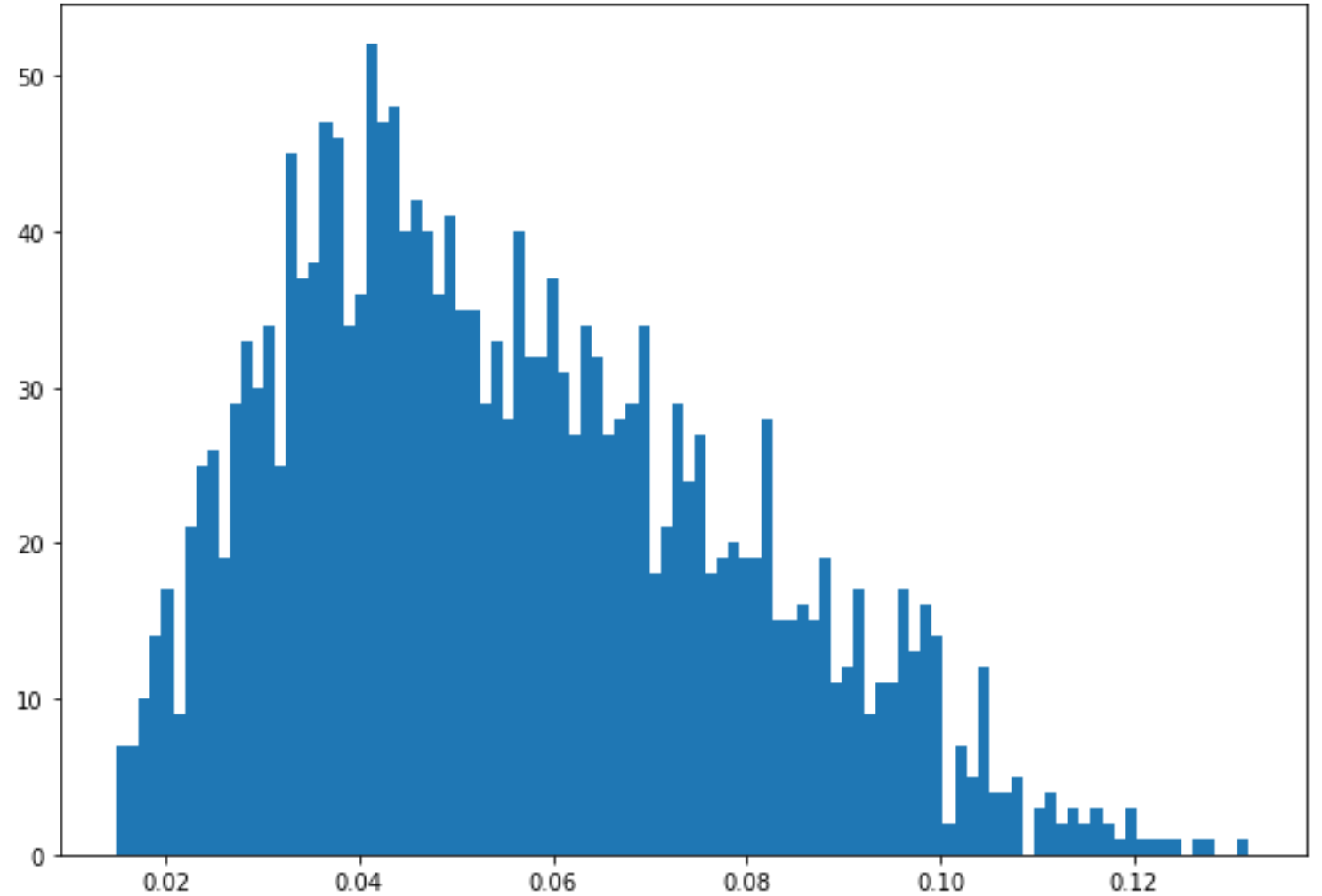
Model 1 Performance: 1x Data

Metric (Test)	Value
MSE	3.10e-3
RMSE	5.56e-2
R ² -score	-



Model 1 Performance: 1x Data

Metric (Test)	Value
MSE	3.10e-3
RMSE	5.56e-2
R ² -score	-



Potential Improvements for Iteration 2

- Greater focus on data preprocessing;
- More refined/complex architecture;
- Include more performance metrics;
- Explore possibilities besides Conv1D;
- Among others!