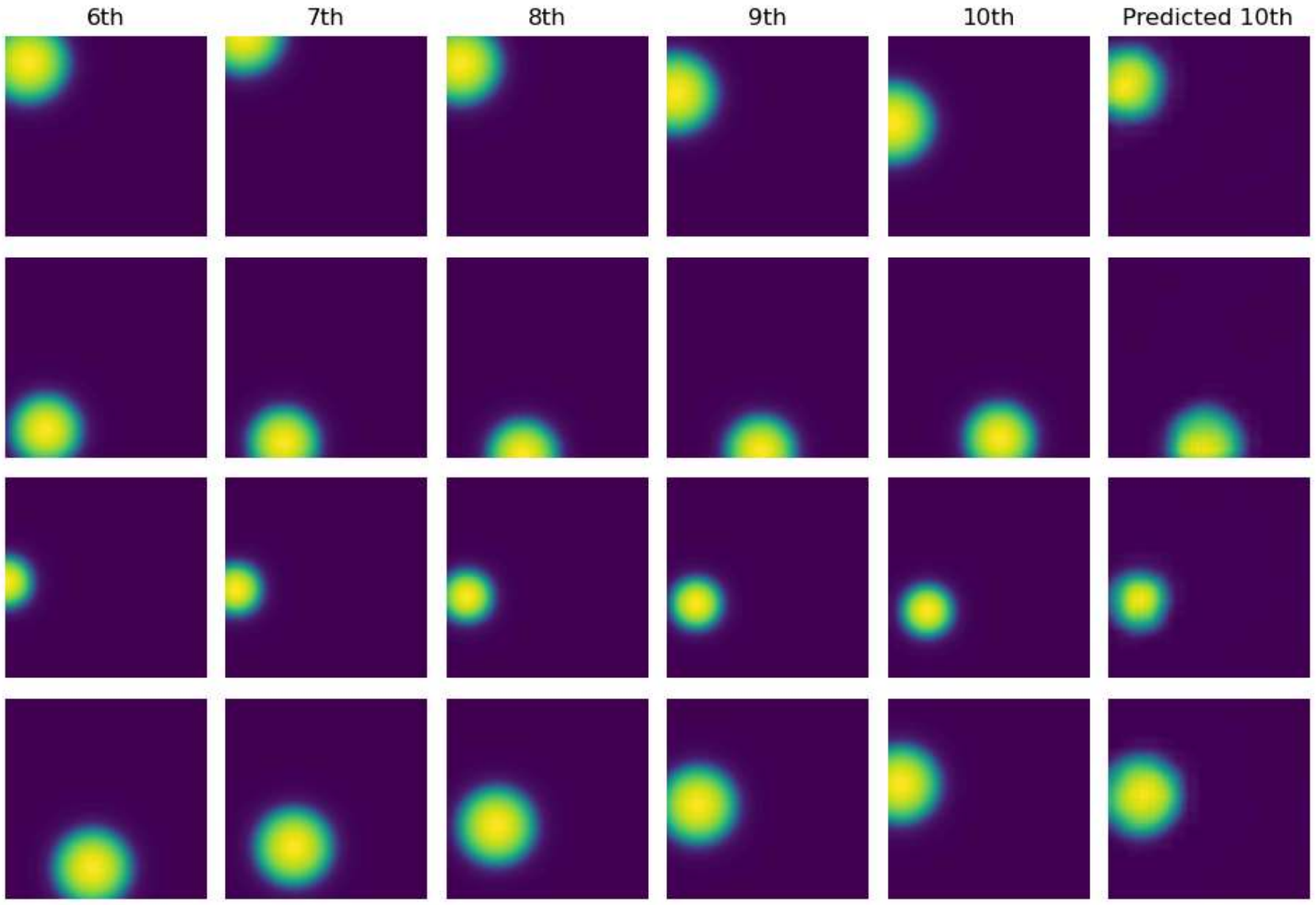
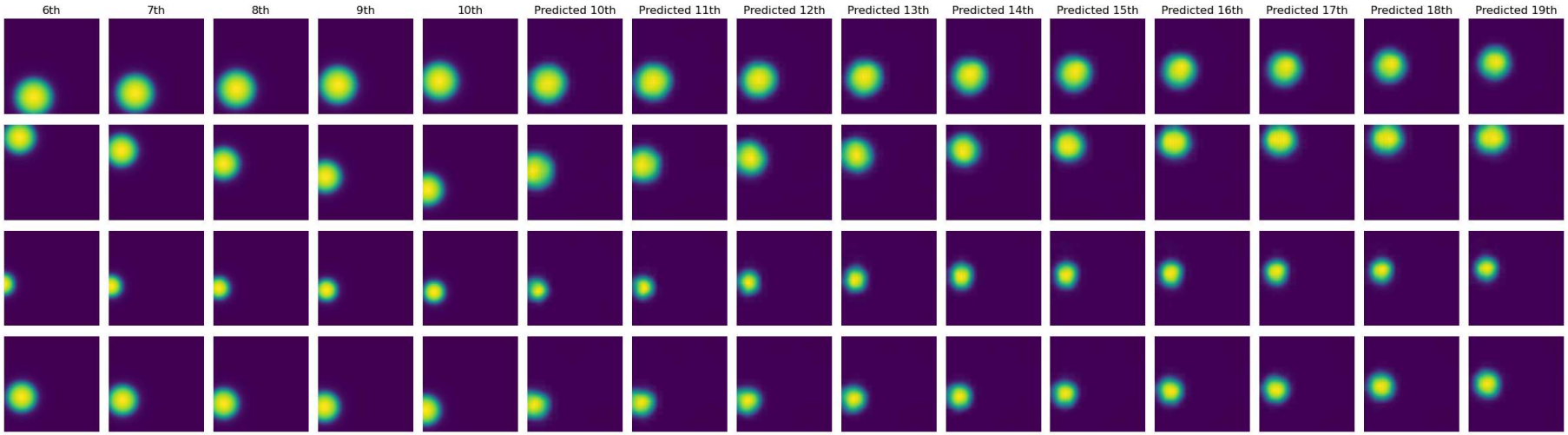
In [ ]:
```
image_prediction_test(
    model_convolution,
    autoencoder=convolutional_autoencoder,
    sequence_loader=sequence_test_loader,
)
```

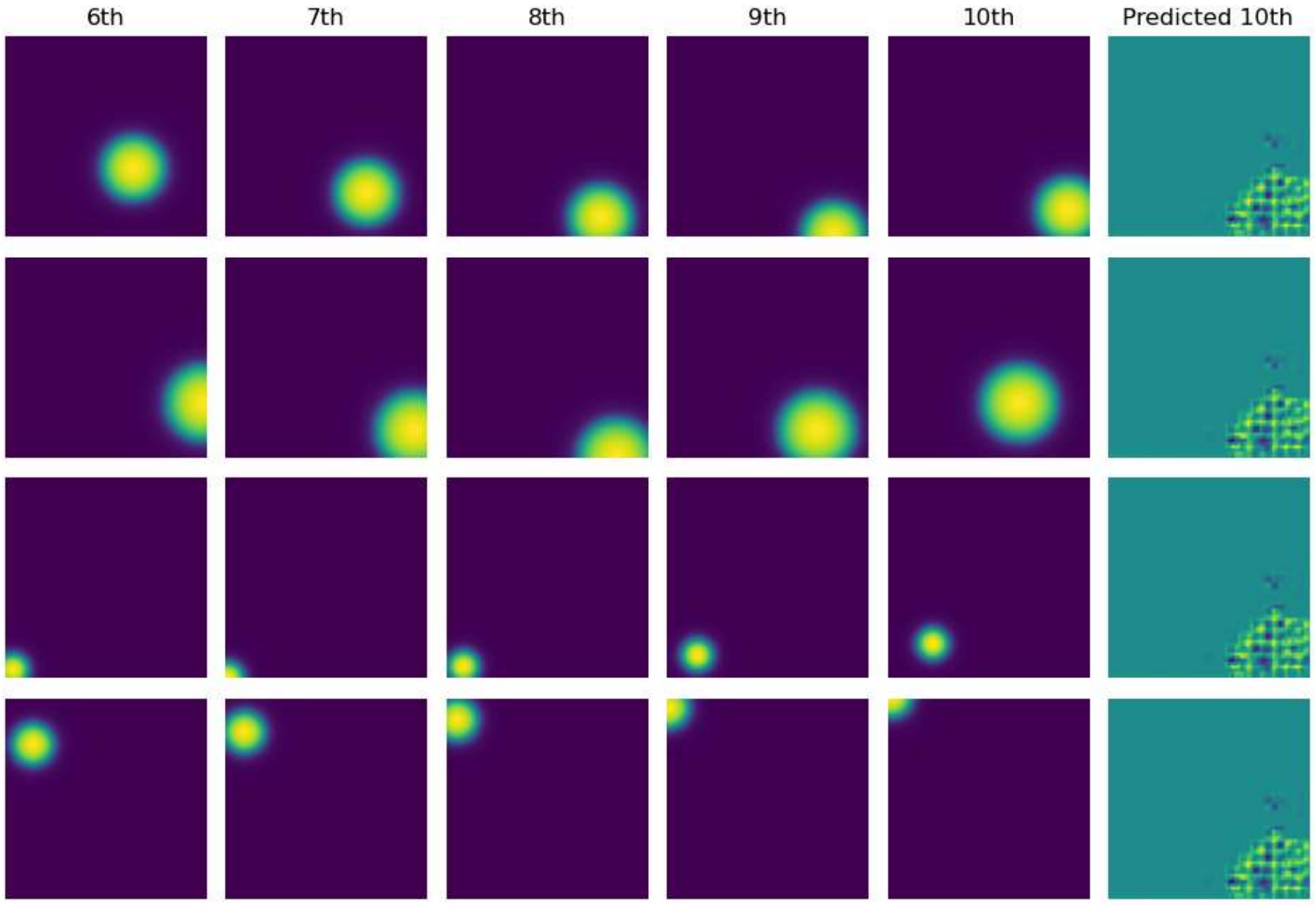


In [ ]:
```
sequence_prediction_test(
    predictor_model=model_convolution,
```

```
    autoencoder=convolutional_autoencoder,
    sequence_loader=sequence_test_loader,
    num_predictions=10,
)
```

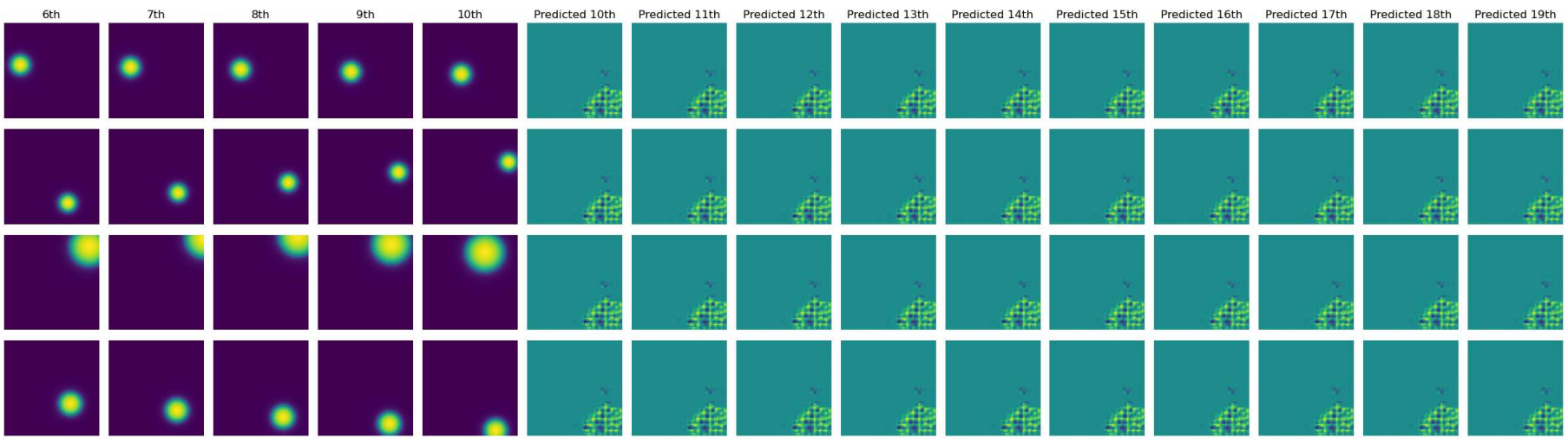


In [ ]:
```
image_prediction_test(
    predictor_model=model_vision,
    autoencoder=vision_autoencoder,
    sequence_loader=sequence_test_loader,
)
```



In [ ]:
```
sequence_prediction_test(
    predictor_model=model_vision,
```

```
    autoencoder=vision_autoencoder,
    sequence_loader=sequence_test_loader,
    num_predictions=10,
)
```



In [ ]:
```
numbers_of_transformer_layers = [1, 2, 4, 8]
convolution_models_data = {}

for i, num_layers in enumerate(numbers_of_transformer_layers):
    model_convolution = TransformerPredictor(
        latent_dim=4, seq_len=9, num_transformer_layers=num_layers, nhead=3
    ).to(device)
    optimizer_convolution = torch.optim.Adam(model_convolution.parameters(), lr=0.01)

    epochs = 10
    losses = train_for_epochs(
        predictor_model=model_convolution,
        autoencoder=convolutional_autoencoder,
        epochs=epochs,
        learning_rate=0.01,
    )
```

```
    epochs = 10
    losses = train_for_epochs(
        predictor_model=model_convolution,
        autoencoder=convolutional_autoencoder,
        epochs=epochs,
        learning_rate=0.001,
    )


    convolution_models_data[num_layers] = {}
    convolution_models_data[num_layers]["model"] = model_convolution
    convolution_models_data[num_layers]["losses"] = losses
```

```
Epoch 0 Loss: 0.6438764255046845 Test Loss: 0.44958075881004333
Epoch 1 Loss: 0.43459611892700195 Test Loss: 0.4025730900466442
Epoch 2 Loss: 0.4033313719034195 Test Loss: 0.38805535435676575
Epoch 3 Loss: 0.3926465814113617 Test Loss: 0.3823278984054923
Epoch 4 Loss: 0.38161939358711244 Test Loss: 0.3749707853421569
Epoch 5 Loss: 0.3815245898962021 Test Loss: 0.3661261131055653
Epoch 6 Loss: 0.3778071185350418 Test Loss: 0.3685197615996003
Epoch 7 Loss: 0.37621648848056793 Test Loss: 0.37048793816938996
Epoch 8 Loss: 0.37404741072654724 Test Loss: 0.36354984529316425
Epoch 9 Loss: 0.37291162157058716 Test Loss: 0.36950052808970213
Epoch 0 Loss: 0.36442016422748563 Test Loss: 0.35989289870485663
Epoch 1 Loss: 0.3605691777467728 Test Loss: 0.35925612365826964
Epoch 2 Loss: 0.35978444600105286 Test Loss: 0.35907844780012965
Epoch 3 Loss: 0.35954435980319976 Test Loss: 0.3594265836291015
Epoch 4 Loss: 0.35718047320842744 Test Loss: 0.3631752938963473
Epoch 5 Loss: 0.3590205053091049 Test Loss: 0.3585313502699137
Epoch 6 Loss: 0.3569862155914307 Test Loss: 0.36107572447508574
Epoch 7 Loss: 0.3571759796142578 Test Loss: 0.3597980351187289
Epoch 8 Loss: 0.3575186116695404 Test Loss: 0.36193982884287834
Epoch 9 Loss: 0.3572134146690369 Test Loss: 0.36028993129730225
Epoch 0 Loss: 0.725515409231186 Test Loss: 0.47044072207063437
Epoch 1 Loss: 0.45026698875427246 Test Loss: 0.424528272356838
Epoch 2 Loss: 0.40749150002002715 Test Loss: 0.3826852757483721
Epoch 3 Loss: 0.3909279823303223 Test Loss: 0.3924238746985793
Epoch 4 Loss: 0.3860820631980896 Test Loss: 0.37284981179982424
Epoch 5 Loss: 0.3823522081375122 Test Loss: 0.38480916479602456
Epoch 6 Loss: 0.38004176914691923 Test Loss: 0.37303792405873537
Epoch 7 Loss: 0.3795509902238846 Test Loss: 0.3702395288273692
Epoch 8 Loss: 0.3761237932443619 Test Loss: 0.37199220107868314
Epoch 9 Loss: 0.3764823069572449 Test Loss: 0.3695121635682881
Epoch 0 Loss: 0.36283092844486237 Test Loss: 0.3605052838101983
Epoch 1 Loss: 0.360432373046875 Test Loss: 0.35923047736287117
Epoch 2 Loss: 0.3591208281517029 Test Loss: 0.36082917265594006
Epoch 3 Loss: 0.3570895328521729 Test Loss: 0.35984926065430045
Epoch 4 Loss: 0.3564594933986664 Test Loss: 0.35873502353206277
Epoch 5 Loss: 0.3571902207136154 Test Loss: 0.3594010230153799
```

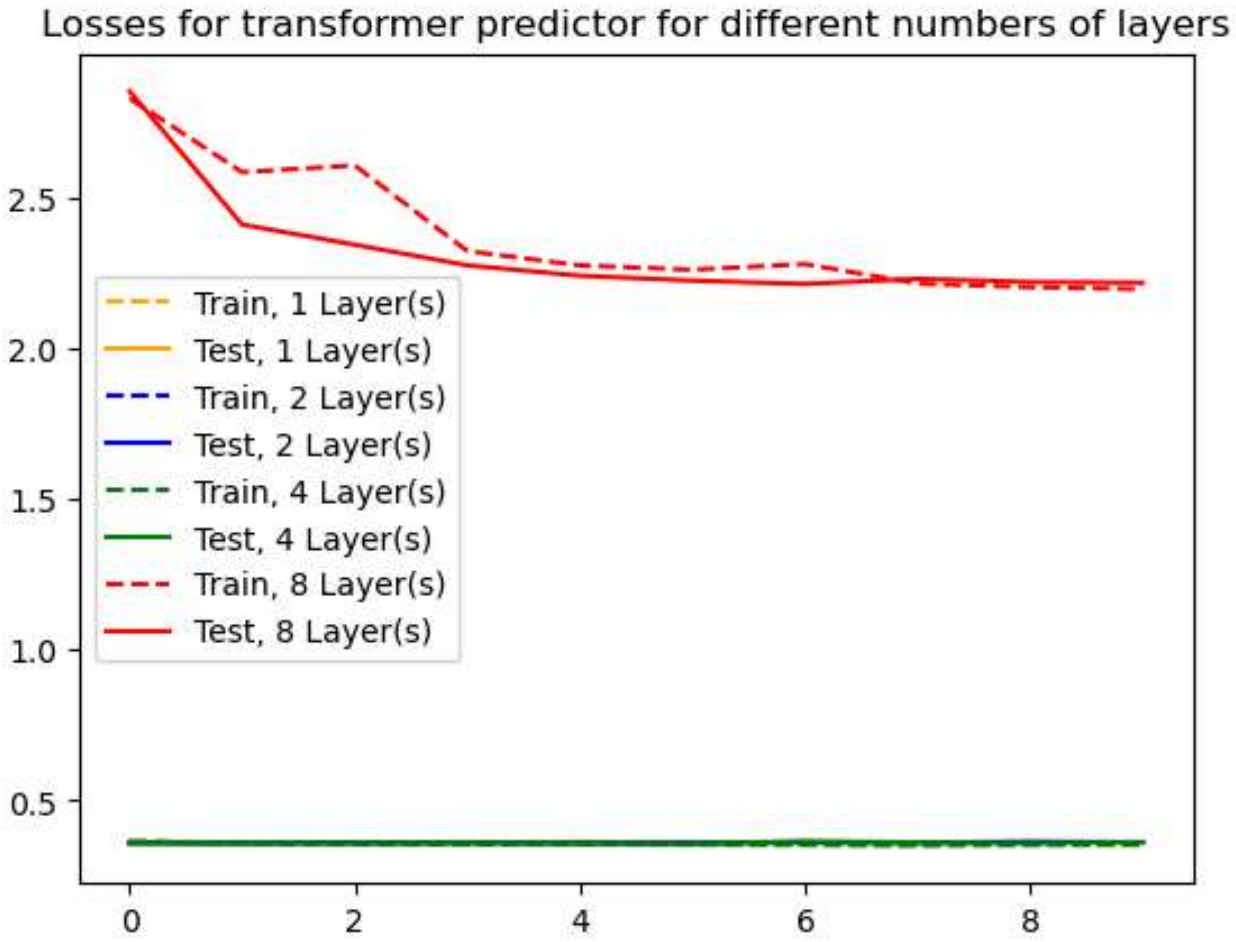
```
Epoch 6 Loss: 0.35558446526527404 Test Loss: 0.3611572152003646
Epoch 7 Loss: 0.3551153064966201 5 Test Loss: 0.3603408019989729
Epoch 8 Loss: 0.3539914963245392 Test Loss: 0.3633834612555802
Epoch 9 Loss: 0.35506865119934083 Test Loss: 0.3615567833185196
Epoch 0 Loss: 1.1410207657814027 Test Loss: 0.8317302968353033
Epoch 1 Loss: 0.7766596312522889 Test Loss: 0.5635499833151698
Epoch 2 Loss: 0.5264718127250672 Test Loss: 0.43916989024728537
Epoch 3 Loss: 0.4424478049278259 Test Loss: 0.4046027883887291
Epoch 4 Loss: 0.40938478910923004 Test Loss: 0.41162405349314213
Epoch 5 Loss: 0.39321551787853243 Test Loss: 0.3927611387334764
Epoch 6 Loss: 0.39616404020786283 Test Loss: 0.3823242033831775
Epoch 7 Loss: 0.3952875032424927 Test Loss: 0.42344505432993174
Epoch 8 Loss: 0.3870119407176971 Test Loss: 0.38454295322299004
Epoch 9 Loss: 0.3868134890794754 Test Loss: 0.3898265827447176
Epoch 0 Loss: 0.36332099556922914 Test Loss: 0.3573608952574432
Epoch 1 Loss: 0.3585934730768204 Test Loss: 0.35845281230285764
Epoch 2 Loss: 0.35664006376266477 Test Loss: 0.3586462587118149
Epoch 3 Loss: 0.3542921293973923 Test Loss: 0.36016336362808943
Epoch 4 Loss: 0.35502883219718934 Test Loss: 0.35875987727195024
Epoch 5 Loss: 0.35371916472911835 Test Loss: 0.35669200913980603
Epoch 6 Loss: 0.3528476049900055 Test Loss: 0.36519142147153616
Epoch 7 Loss: 0.35069686090946195 Test Loss: 0.36091719288378954
Epoch 8 Loss: 0.3531664047241211 Test Loss: 0.3583914786577225
Epoch 9 Loss: 0.3530906022787094 Test Loss: 0.3621045369654894
Epoch 0 Loss: 2.6794480352401733 Test Loss: 2.852909840643406
Epoch 1 Loss: 2.8515470237731932 Test Loss: 2.857894718647003
Epoch 2 Loss: 2.7185391597747803 Test Loss: 3.1110502034425735
Epoch 3 Loss: 2.8453299503326415 Test Loss: 2.85140660405159
Epoch 4 Loss: 2.8320754623413085 Test Loss: 2.850867100059986
Epoch 5 Loss: 2.830075838088989 Test Loss: 2.85296081751585
Epoch 6 Loss: 2.8299121379852297 Test Loss: 2.852502480149269
Epoch 7 Loss: 2.83007715511322 Test Loss: 2.8518596664071083
Epoch 8 Loss: 2.826989427566528 Test Loss: 2.8504305332899094
Epoch 9 Loss: 2.828161416053772 Test Loss: 2.853809006512165
Epoch 0 Loss: 2.827146640777588 Test Loss: 2.850511111319065
Epoch 1 Loss: 2.582418670654297 Test Loss: 2.408949453383684
```

```
Epoch 2 Loss: 2.6050479049682616 Test Loss: 2.3420917503535748
Epoch 3 Loss: 2.32120800113678 Test Loss: 2.273746620863676
Epoch 4 Loss: 2.2736113061904906 Test Loss: 2.239305131137371
Epoch 5 Loss: 2.259194407463074 Test Loss: 2.2232073917984962
Epoch 6 Loss: 2.2780676689147947 Test Loss: 2.2120608389377594
Epoch 7 Loss: 2.2134618349075317 Test Loss: 2.2291551791131496
Epoch 8 Loss: 2.201528561592102 Test Loss: 2.218358129262924
Epoch 9 Loss: 2.195199710845947 Test Loss: 2.2161019183695316
```

In [ ]:

```python
colors = ["orange", "blue", "green", "red", "black"]
assert len(colors) >= len(convolution_models_data)
for i, (num_layers, data) in enumerate(convolution_models_data.items()):
    losses = data["losses"]
    plt.plot(
        losses["Train"],
        linestyle="--",
        label=f"Train, {num_layers} Layer(s)",
        color=colors[i],
    )
    plt.plot(
        losses["Test"],
        label=f"Test, {num_layers} Layer(s)",
        color=colors[i],
    )

plt.title("Losses for transformer predictor for different numbers of layers")
plt.legend()
plt.show()
```



In [ ]:
```
colors = ["orange", "blue", "green", "red", "black"]
assert len(colors) >= len(vision_models_data)
for i, (num_layers, data) in enumerate(vision_models_data.items()):
    losses = data["losses"]
    plt.plot(
        losses["Train"],
        linestyle="--",
        label=f"Train, {num_layers} Layer(s)",
        color=colors[i],
    )
```

```
    plt.plot(
        losses["Test"],
        label=f"Test, {num_layers} Layer(s)",
        color=colors[i],
    )

plt.title("Losses for Vision Transformer autoencodern frame predictor for different numbers of layers")
plt.legend()
plt.show()
```