report_experiments

December 9, 2022

[36]:
```
import matplotlib.pyplot as plt
from PIL import Image
from IPython.display import Video
```

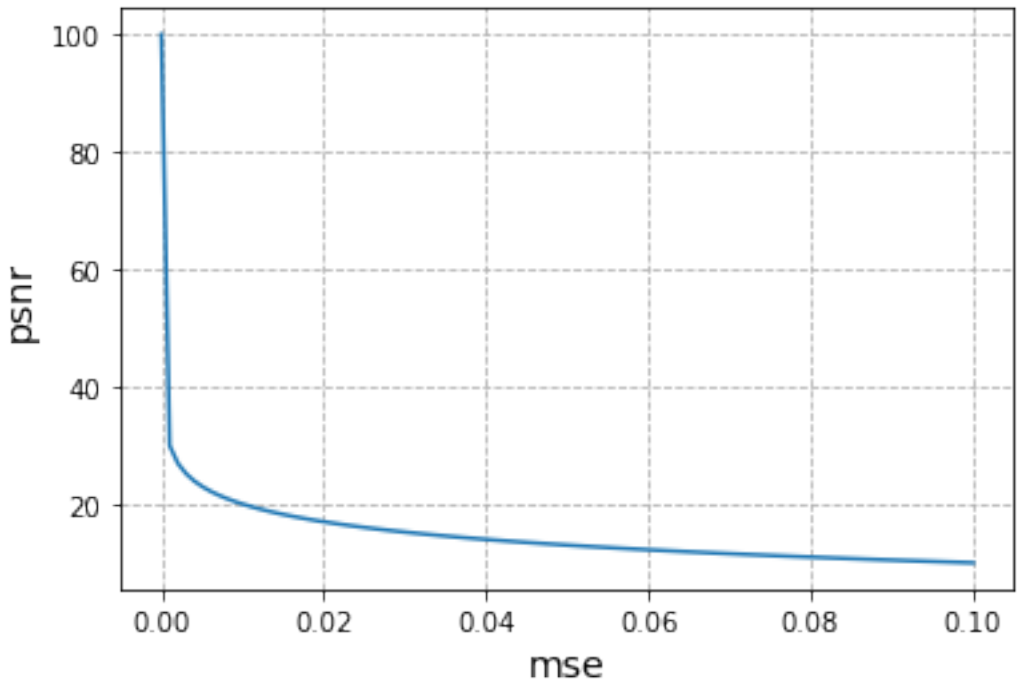
0.0.1 Peak Signal-to-Noise Ratio

$\text{PSNR} = -10 \log_{10}(\text{MSE})$

[35]:
```
mse = np.linspace(0., 0.1, 100)
psnr = -10. * np.log10(mse+1e-10)

fig = plt.figure()
plt.plot(mse, psnr)
plt.grid(linestyle='--')
plt.xlabel("mse", fontsize=14)
plt.ylabel("psnr", fontsize=14)
```

[35]:
```
Text(0, 0.5, 'psnr')
```



1 Experiments

1.1 Experiment - Effect of Positional Encoding

- Trained the network for 200k iterations on 150 training samples (100 train + 50 val) and performed validation on the remaining 50 validation samples.
- Denote: Model-1 with positional encoding and Model-2 without positional encoding.
- Clearly, Model-1 performs better than Model-2 based on the validation set PSNR.
- Model-1 Validation PSNR > 26, Model-2 Validation PSNR > 23

1.2 Model-1 (with positional encoding) & Model-2 (without positional encoding)

1.3 Model-1 vs Model-2 Loss Plot

[57]:
```
fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp001_whitebkgd/trainloss_plot.png"))
plt.title("Model-1 Training Loss", fontweight="bold")

fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp001_whitebkgd_noembed/trainloss_plot.
↪png"))
```

```
plt.title("Model-2 Training Loss", fontweight="bold")
```

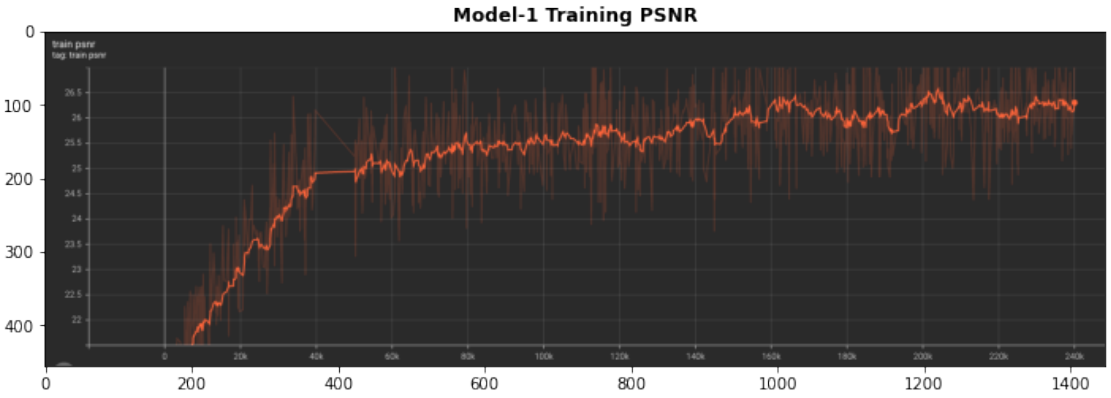
[57]: Text(0.5, 1.0, 'Model-2 Training Loss')

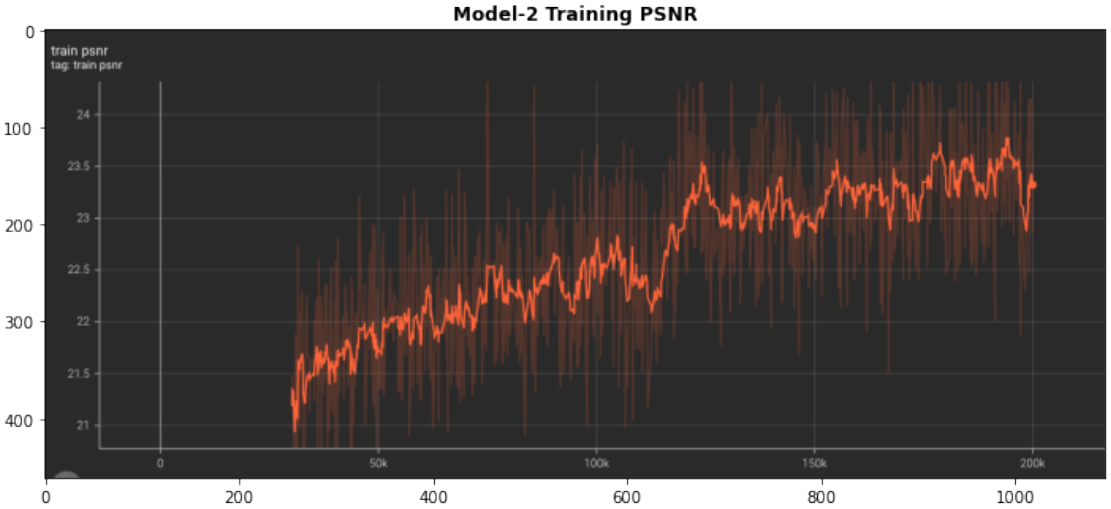
1.4 Model-1 vs Model-2 Training PSNR Plot

[58]:
```
fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp001_whitebkgd/train_psnr_plot.png"))
plt.title("Model-1 Training PSNR", fontweight="bold")

fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp001_whitebkgd_noembed/train_psnr_plot.
 ↪png"))
plt.title("Model-2 Training PSNR", fontweight="bold")
```

[58]:
```
Text(0.5, 1.0, 'Model-2 Training PSNR')
```



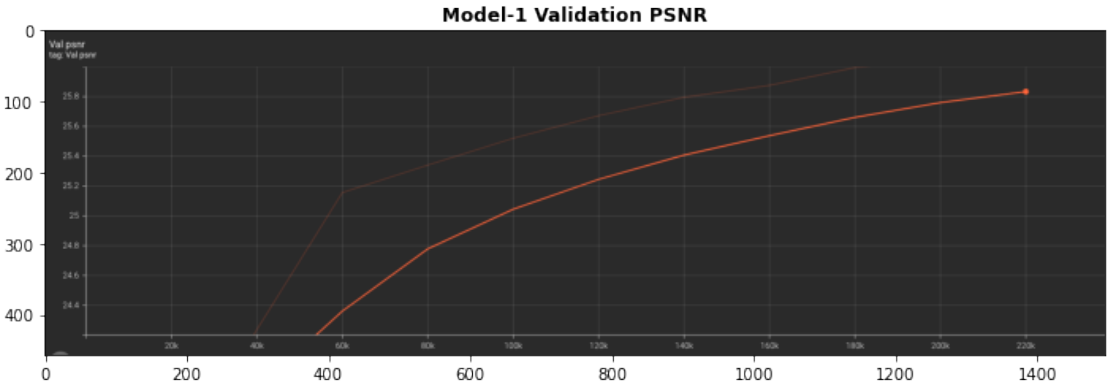


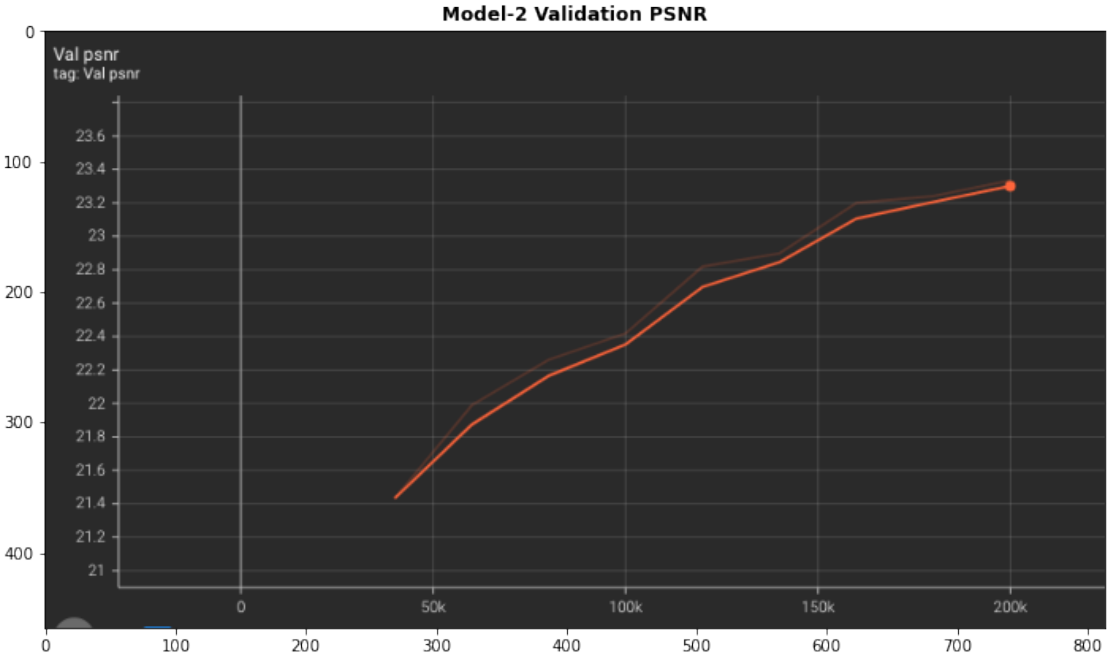
1.5 Model-1 vs Model-2 Validation PSNR Plot

[59]:
```
fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp001_whitebkgd/val_psnr_plot.png"))
plt.title("Model-1 Validation PSNR", fontweight="bold")

fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp001_whitebkgd_noembed/val_psnr_plot.
↪png"))
plt.title("Model-2 Validation PSNR", fontweight="bold")
```

[59]:
```
Text(0.5, 1.0, 'Model-2 Validation PSNR')
```



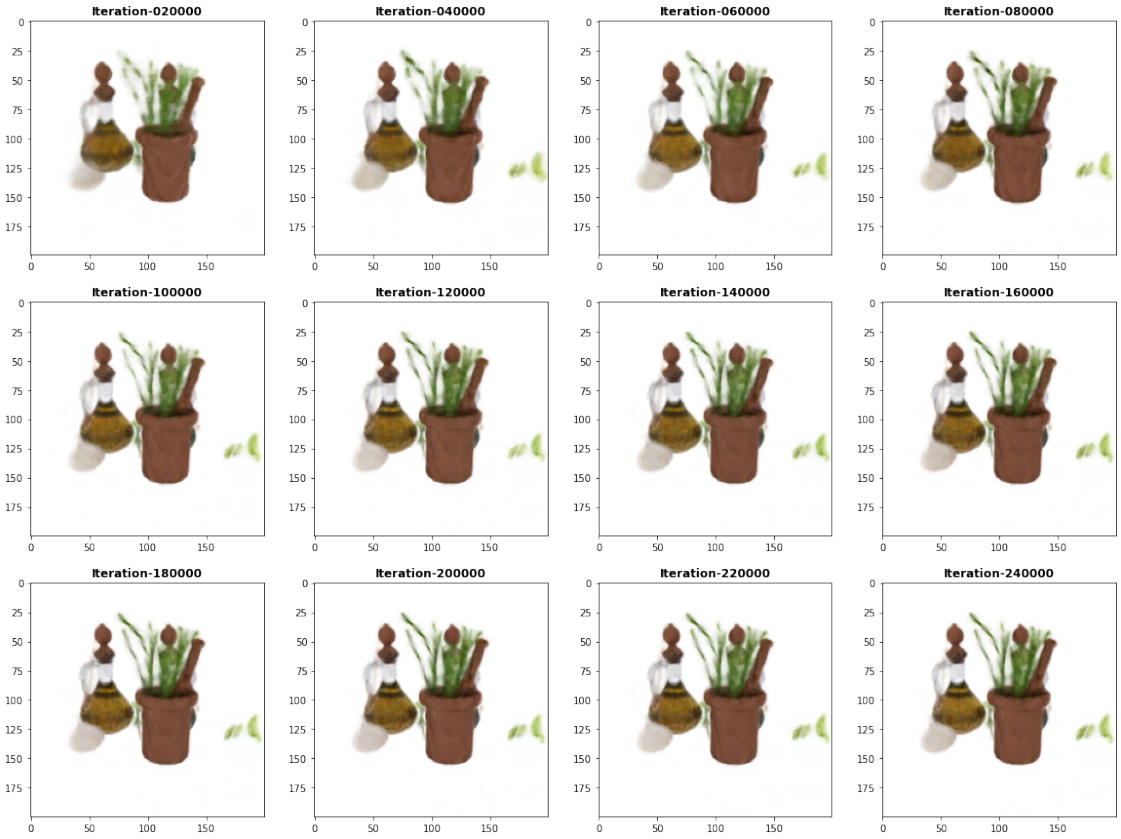


1.6 Model-1: Synthesized Validation Images during training : 1_val_0075.png

[44]:
```
fig = plt.figure(figsize=(20, 15))

file_lst = ["020000", "040000", "060000", "080000", "100000", "120000",␣
 ↪"140000", "160000", "180000", "200000", "220000",
            "240000"]

for i in range(len(file_lst)):
    plt.subplot(3,4,i+1)
    plt.imshow(Image.open("../logdir/finalexp001_whitebkgd/
 ↪valset_"+file_lst[i]+"/025.png"))
    plt.title("Iteration-"+file_lst[i], fontweight="bold")
```

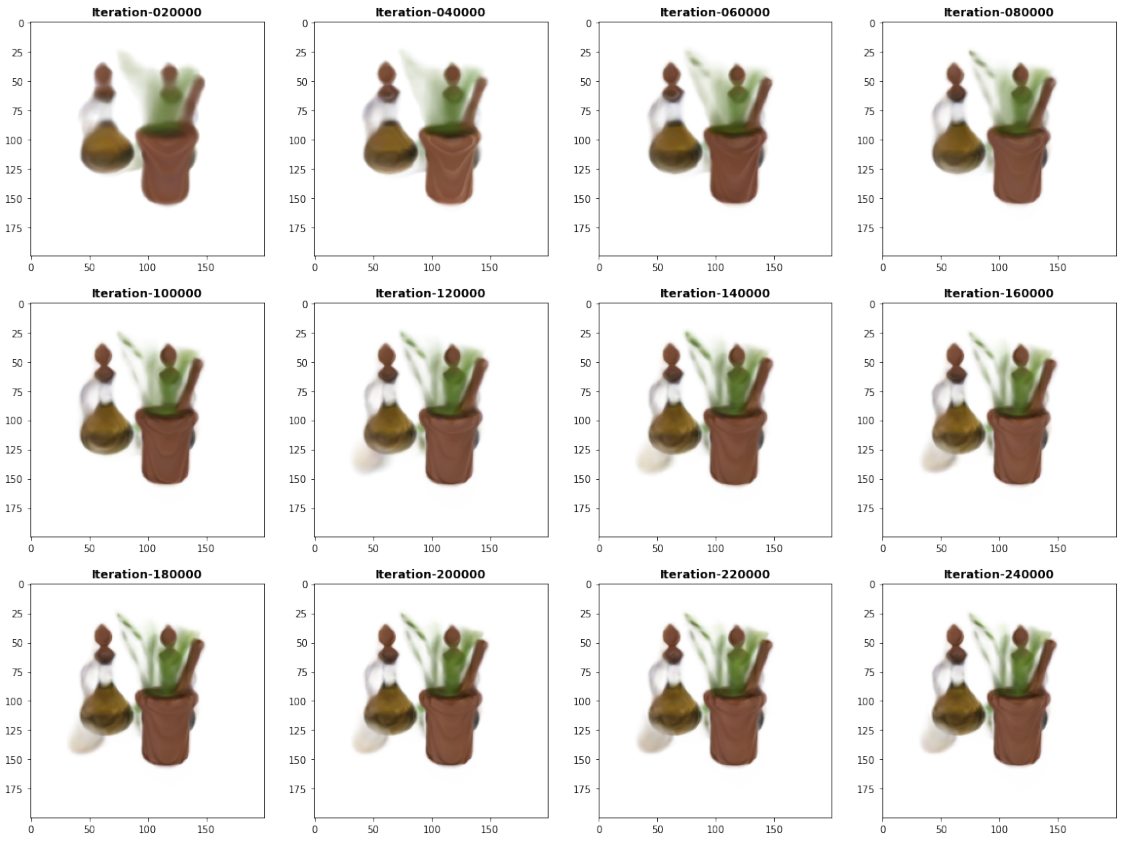


1.7 Model-2: Synthesized Validation Images during training : 1_val_0075.png

[43]:
```
fig = plt.figure(figsize=(20, 15))

file_lst = ["020000", "040000", "060000", "080000", "100000", "120000",␣
 ↪"140000", "160000", "180000", "200000", "220000",
            "240000"]

for i in range(len(file_lst)):
    plt.subplot(3,4,i+1)
    plt.imshow(Image.open("../logdir/finalexp001_whitebkgd_noembed/
 ↪valset_"+file_lst[i]+"/025.png"))
    plt.title("Iteration-"+file_lst[i], fontweight='bold')
```



1.8 Model-1 Synthesized Images: 1_val_0050 - 1_val_0099

[40]:
```
Video("../logdir/finalexp001_whitebkgd/finalexp001_whitebkgd_valset_240000_rgb.
 ↪mp4")
```

[40]: <IPython.core.display.Video object>

1.9 Model-2 Synthesized Images: 1_val_0050 - 1_val_0099

[45]:
```
Video("../logdir/finalexp001_whitebkgd_noembed/
 ↪finalexp001_whitebkgd_noembed_valset_240000_rgb.mp4")
```

[45]: <IPython.core.display.Video object>

1.10 Model-1 Synthesized Test Images - 2_test_(0000, 0016, 0055, 0093, 0160)

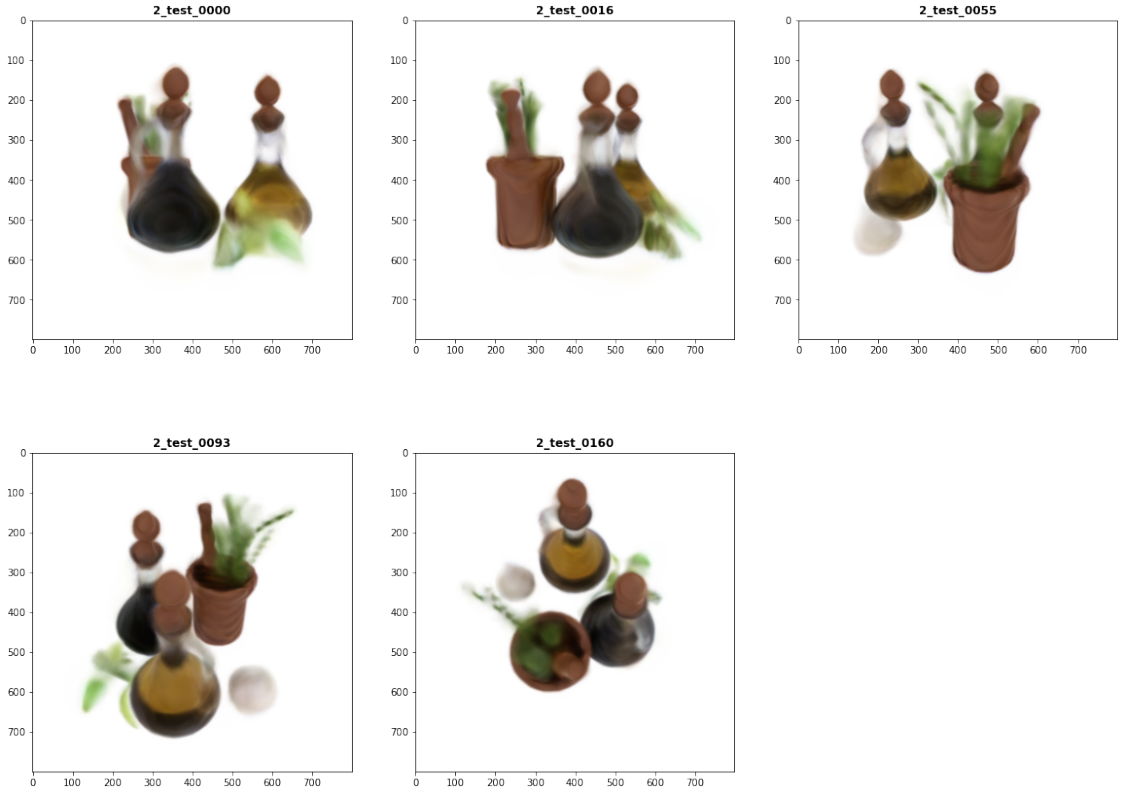
[50]:
```
fig = plt.figure(figsize=(20, 15))
file_lst = ["2_test_0000", "2_test_0016", "2_test_0055", "2_test_0093",␣
 ↪"2_test_0160"]

for i in range(len(file_lst)):
    if i == 5:
        break
    plt.subplot(2, 3, i+1)
    plt.imshow(Image.open("../logdir/finalexp001_whitebkgd/testset_250000/
 ↪"+file_lst[i]+".png"))
    plt.title(file_lst[i], fontweight='bold')
```

1.11 Model-2 : Synthesized Test Images - 2_test_(0000, 0016, 0055, 0093, 0160)

[51]:
```
fig = plt.figure(figsize=(20, 15))
file_lst = ["2_test_0000", "2_test_0016", "2_test_0055", "2_test_0093",␣
 ↪"2_test_0160"]

for i in range(len(file_lst)):
    if i == 5:
        break
    plt.subplot(2, 3, i+1)
    plt.imshow(Image.open("../logdir/finalexp001_whitebkgd_noembed/
 ↪testset_250000/"+file_lst[i]+".png"))
    plt.title(file_lst[i], fontweight='bold')
```

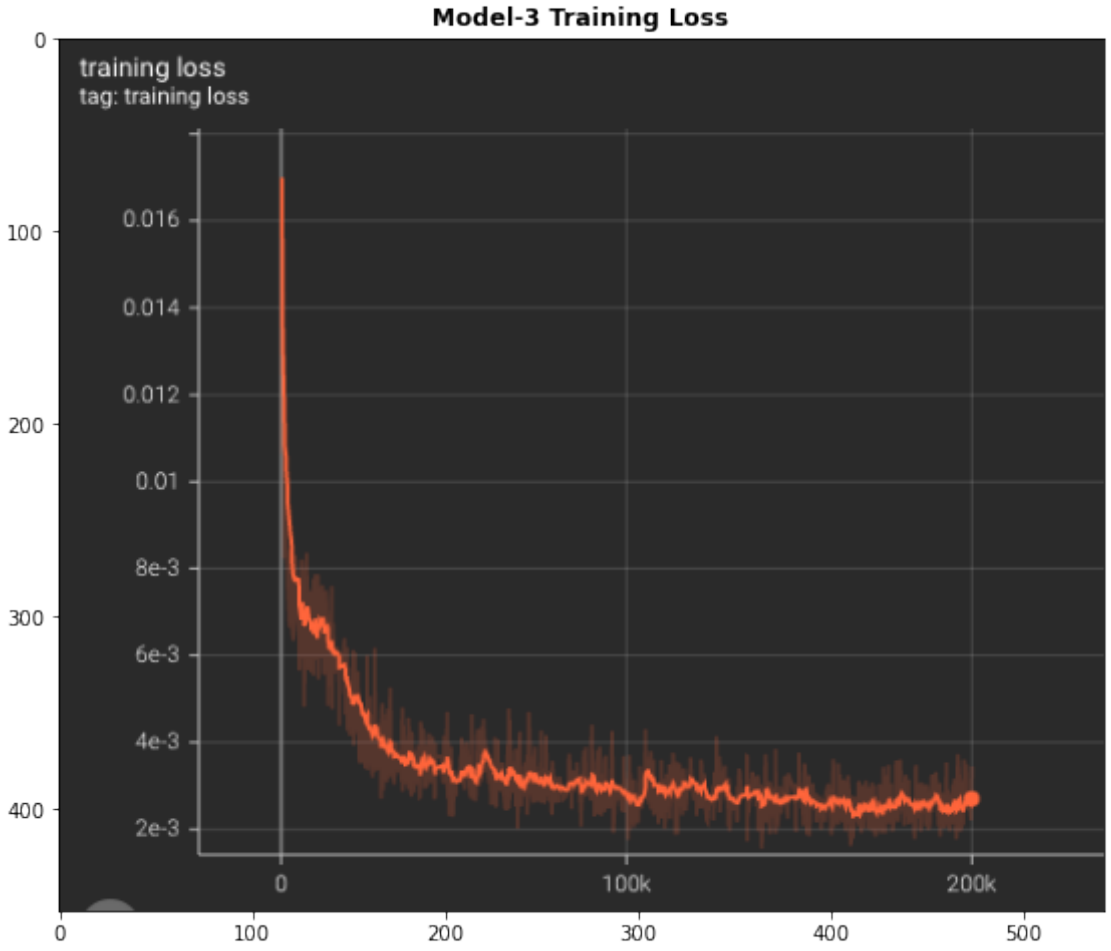


1.12 Experiment - Reducing the number of positional encoding parameters

- Used L = 5 for encoding position coordinates instead of L=10 used for Model-1 and 2
- Used L = 2 for encoding direction coordinates instead of L=5 used for Model-1 and 2
- Denote this trained model by Model-3
- Trained this model for 200k iterations

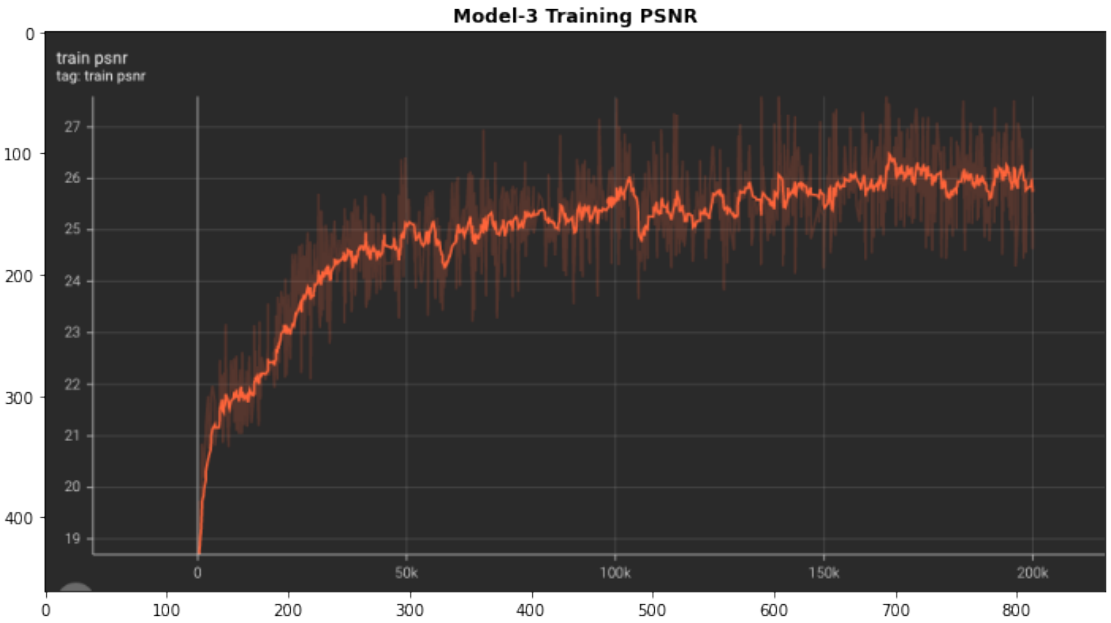
[60]:
```
fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp002_whitebkgd/train_loss_plot.png"))
plt.title("Model-3 Training Loss", fontweight="bold")
```

[60]:
```
Text(0.5, 1.0, 'Model-3 Training Loss')
```



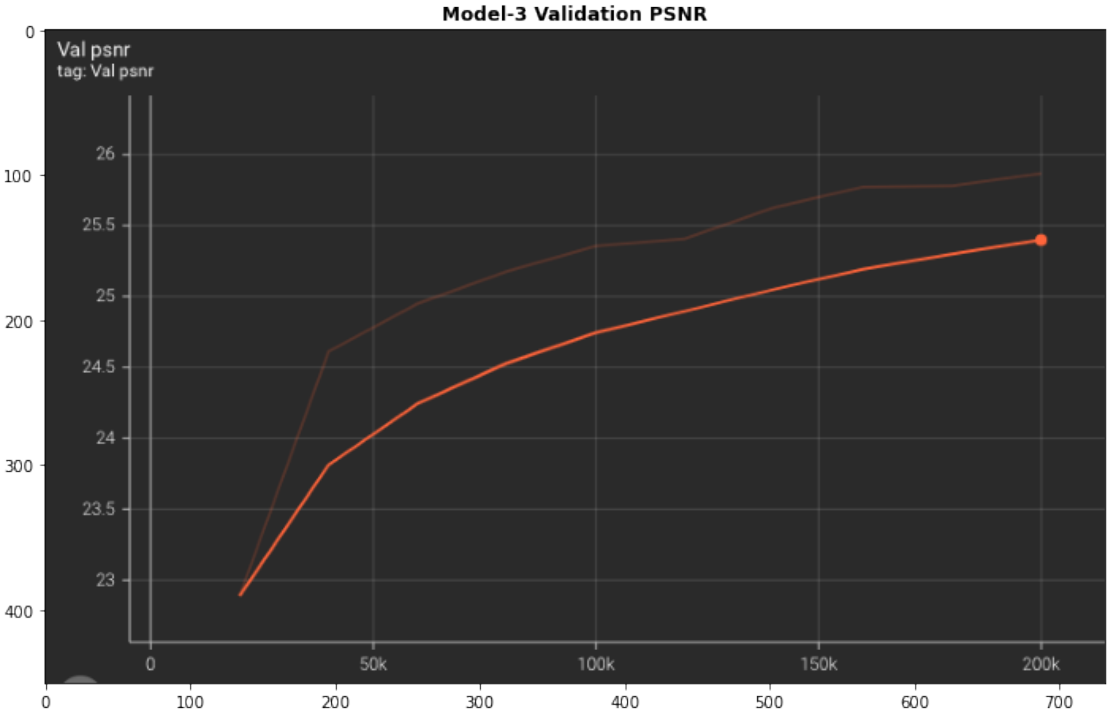
[61]:
```
fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp002_whitebkgd/train_psnr_plot.png"))
plt.title("Model-3 Training PSNR", fontweight="bold")
```

[61]: Text(0.5, 1.0, 'Model-3 Training PSNR')



[62]:
```
fig = plt.figure(figsize=(12,8))
plt.imshow(Image.open("../logdir/finalexp002_whitebkgd/val_psnr_plot.png"))
plt.title("Model-3 Validation PSNR", fontweight="bold")
```

[62]: Text(0.5, 1.0, 'Model-3 Validation PSNR')

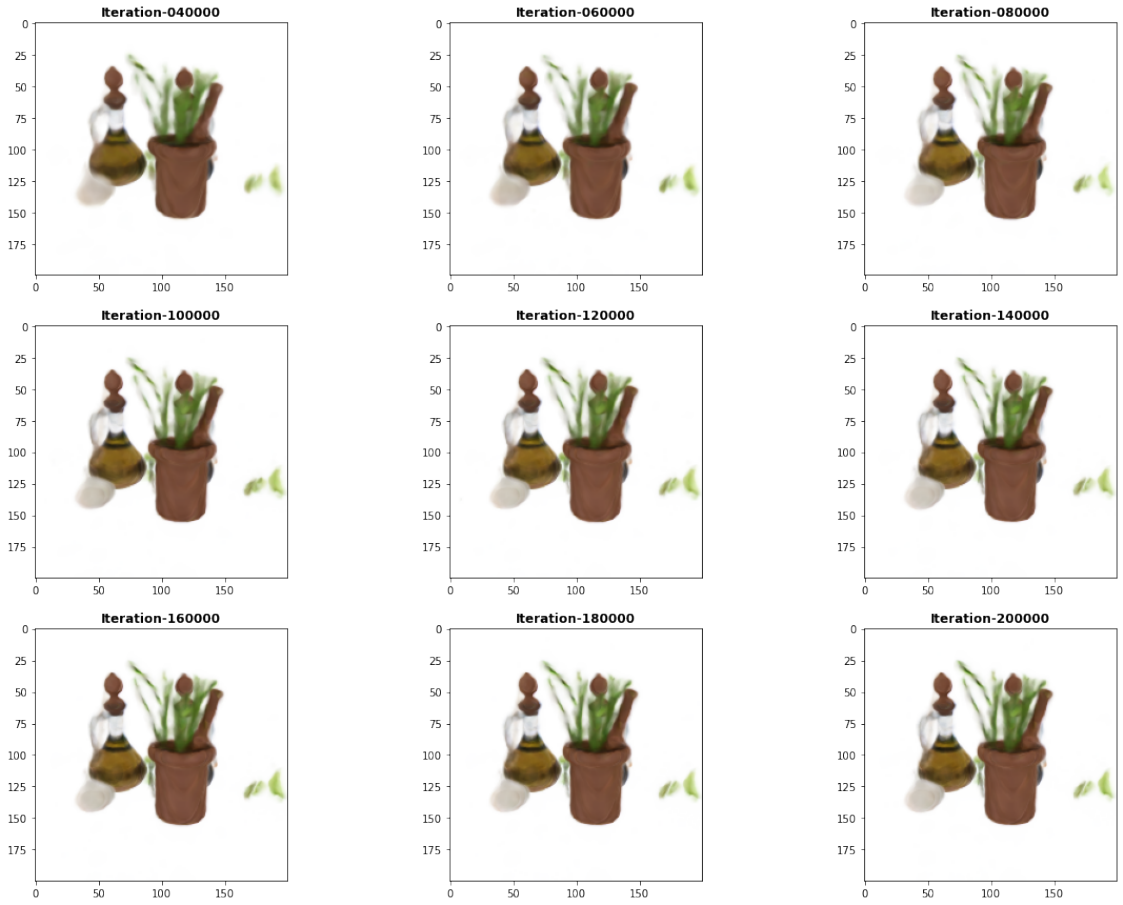


1.13 Model-3 Synthesized Validation Images

[47]:
```
fig = plt.figure(figsize=(20, 15))

file_lst = ["040000", "060000", "080000", "100000", "120000", "140000",␣
 ↪"160000", "180000", "200000"]

for i in range(len(file_lst)):
    plt.subplot(3,3,i+1)
    plt.imshow(Image.open("../logdir/finalexp002_whitebkgd/
 ↪valset_"+file_lst[i]+"/025.png"))
    plt.title("Iteration-"+file_lst[i], fontweight='bold')
```



1.14 Model-3 Synthesized Images: 1_val_0050 - 1_val_0099

[52]:
```
Video("../logdir/finalexp002_whitebkgd/finalexp002_whitebkgd_valset_200000_rgb.
↪mp4")
```

[52]:
```
<IPython.core.display.Video object>
```