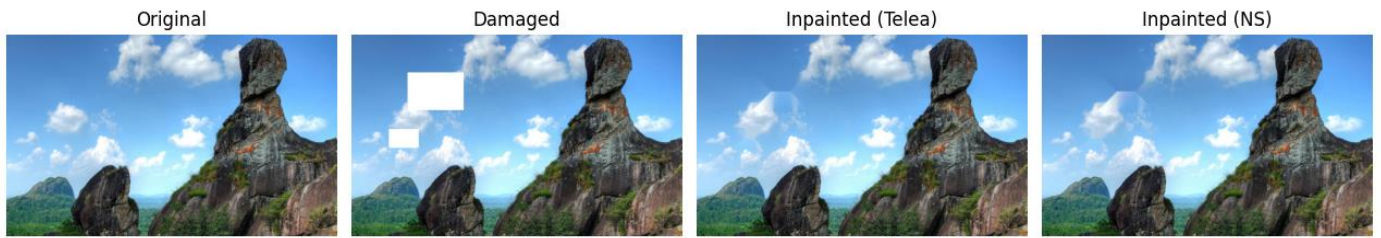


IMAGE INPAINTING**IMAGE STITCHING**

Keypoint Matches Between Image 1 and Image 2



Keypoint Matches Between Image 2 and Image 3



Image 1



Image 2



Image 3



Stitched Panorama



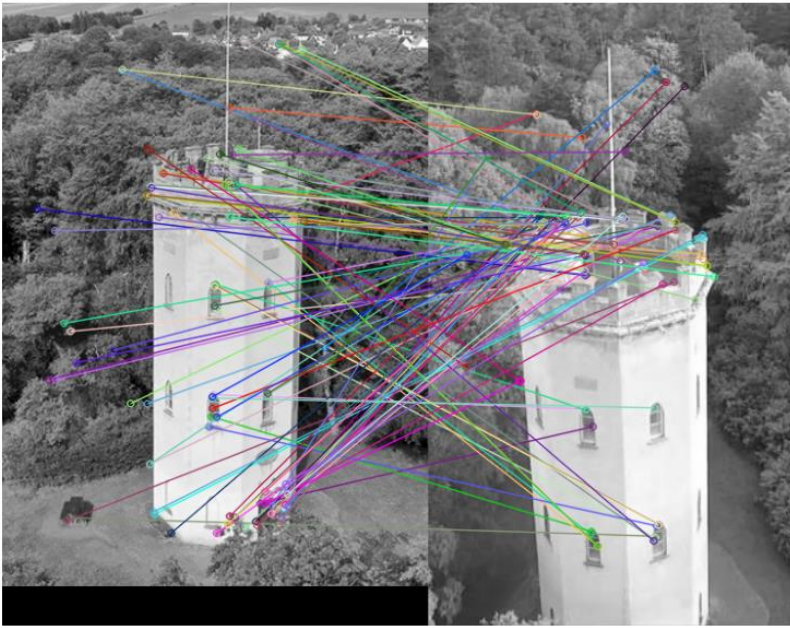
Image 1 shape: (2389, 1284, 3)

Image 2 shape: (2389, 1541, 3)

Image 3 shape: (2389, 1257, 3)

FEATURE MATCHES

Feature Matches



Fundamental Matrix:

```
[[ 2.93754045e-05 -4.87403255e-06 -5.83383553e-03]
 [ 3.38477214e-07  3.43236886e-06 -6.35610914e-04]
 [-4.37580516e-03 -7.78717628e-05  1.00000000e+00]]
```

Essential Matrix:

```
[[ -0.48272258  0.23809293 -0.23994155]
 [ 0.24887076  0.65021253  0.12292811]
 [-0.32579293  0.14330044 -0.16192083]]
```

Rotation Matrix (R):

```
[[ -0.54768165 -0.76185874  0.34585555]
 [-0.81509633  0.3925327  -0.42607047]
 [ 0.1888459  -0.51525657 -0.83597122]]
```

Translation Vector (t):

```
[[ -0.55266394]
 [ 0.01874526]
 [ 0.83319336]]
```

IMAGE RESTORATION

Model: "functional_3"

Layer (type)	Output Shape	Param #
input_layer_3 (InputLayer)	(None, 32, 32, 1)	0
conv2d_15 (Conv2D)	(None, 32, 32, 32)	320
batch_normalization_12 (BatchNormalization)	(None, 32, 32, 32)	128
max_pooling2d_12 (MaxPooling2D)	(None, 16, 16, 32)	0
dropout_6 (Dropout)	(None, 16, 16, 32)	0
conv2d_16 (Conv2D)	(None, 16, 16, 64)	18,496
batch_normalization_13 (BatchNormalization)	(None, 16, 16, 64)	256
max_pooling2d_13 (MaxPooling2D)	(None, 8, 8, 64)	0
dropout_7 (Dropout)	(None, 8, 8, 64)	0
conv2d_17 (Conv2D)	(None, 8, 8, 128)	73,856
batch_normalization_14 (BatchNormalization)	(None, 8, 8, 128)	512
max_pooling2d_14 (MaxPooling2D)	(None, 4, 4, 128)	0
conv2d_18 (Conv2D)	(None, 4, 4, 256)	295,168
batch_normalization_15 (BatchNormalization)	(None, 4, 4, 256)	1,024
max_pooling2d_15 (MaxPooling2D)	(None, 2, 2, 256)	0
conv2d_transpose_12 (Conv2DTranspose)	(None, 2, 2, 256)	590,080
up_sampling2d_12 (UpSampling2D)	(None, 4, 4, 256)	0
conv2d_transpose_13 (Conv2DTranspose)	(None, 4, 4, 128)	295,040
up_sampling2d_13 (UpSampling2D)	(None, 8, 8, 128)	0
conv2d_transpose_14 (Conv2DTranspose)	(None, 8, 8, 64)	73,792
up_sampling2d_14 (UpSampling2D)	(None, 16, 16, 64)	0
conv2d_transpose_15 (Conv2DTranspose)	(None, 16, 16, 32)	18,464
up_sampling2d_15 (UpSampling2D)	(None, 32, 32, 32)	0
conv2d_19 (Conv2D)	(None, 32, 32, 1)	289

Total params: 1,367,425 (5.22 MB)

Trainable params: 1,366,465 (5.21 MB)

Non-trainable params: 960 (3.75 KB)

Epoch 1/100

391/391 20s 28ms/step - loss: 0.0247 - val_loss: 0.0464

Epoch 2/100

391/391 11s 14ms/step - loss: 0.0145 - val_loss: 0.0155

Epoch 3/100

391/391 10s 14ms/step - loss: 0.0128 - val_loss: 0.0134

Epoch 4/100

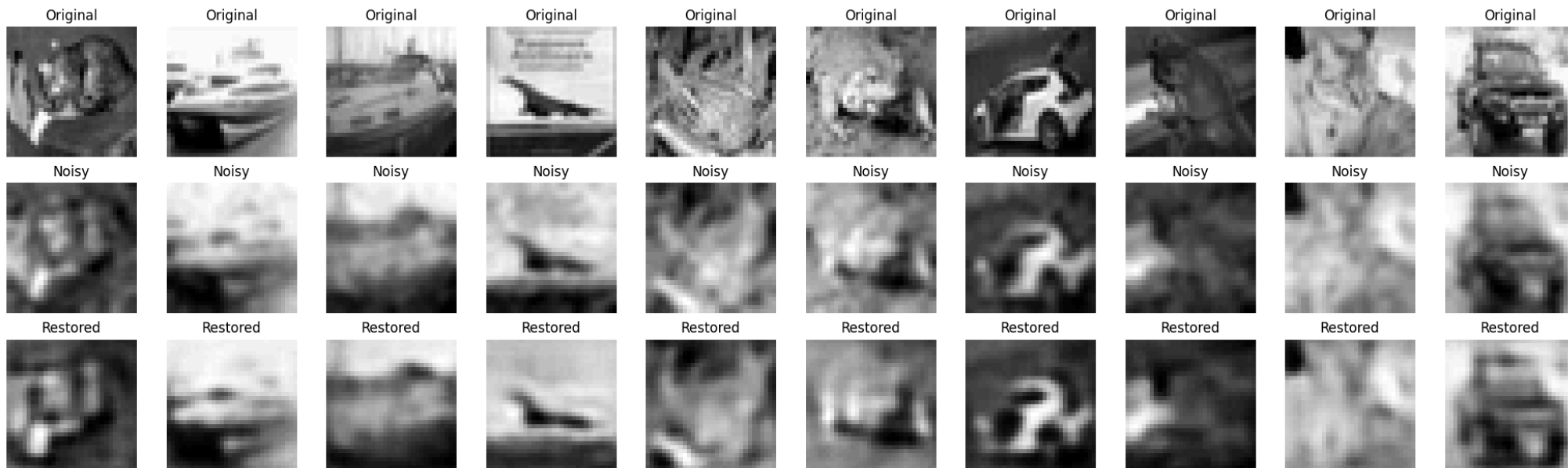
391/391 10s 13ms/step - loss: 0.0118 - val_loss: 0.0126

Epoch 5/100

Epoch 5/100
391/391 ————— 10s 13ms/step - loss: 0.0111 - val_loss: 0.0119
Epoch 6/100
391/391 ————— 10s 13ms/step - loss: 0.0106 - val_loss: 0.0119
Epoch 7/100
391/391 ————— 6s 14ms/step - loss: 0.0101 - val_loss: 0.0116
Epoch 8/100
391/391 ————— 10s 13ms/step - loss: 0.0098 - val_loss: 0.0116
Epoch 9/100
391/391 ————— 5s 14ms/step - loss: 0.0095 - val_loss: 0.0107
Epoch 10/100
391/391 ————— 5s 13ms/step - loss: 0.0092 - val_loss: 0.0106
Epoch 11/100
391/391 ————— 5s 13ms/step - loss: 0.0089 - val_loss: 0.0108
Epoch 12/100
391/391 ————— 5s 13ms/step - loss: 0.0088 - val_loss: 0.0103
Epoch 13/100
391/391 ————— 5s 13ms/step - loss: 0.0086 - val_loss: 0.0097
Epoch 14/100
391/391 ————— 11s 14ms/step - loss: 0.0084 - val_loss: 0.0094
Epoch 15/100
391/391 ————— 10s 13ms/step - loss: 0.0083 - val_loss: 0.0090
Epoch 16/100
391/391 ————— 5s 13ms/step - loss: 0.0081 - val_loss: 0.0089
Epoch 17/100
391/391 ————— 5s 13ms/step - loss: 0.0081 - val_loss: 0.0087
Epoch 18/100
391/391 ————— 5s 13ms/step - loss: 0.0079 - val_loss: 0.0082
Epoch 19/100
391/391 ————— 5s 14ms/step - loss: 0.0078 - val_loss: 0.0080
Epoch 20/100
391/391 ————— 5s 13ms/step - loss: 0.0077 - val_loss: 0.0083
Epoch 21/100
391/391 ————— 5s 14ms/step - loss: 0.0075 - val_loss: 0.0079
Epoch 22/100
391/391 ————— 5s 13ms/step - loss: 0.0075 - val_loss: 0.0081
Epoch 23/100
391/391 ————— 5s 13ms/step - loss: 0.0074 - val_loss: 0.0077
Epoch 24/100
391/391 ————— 10s 14ms/step - loss: 0.0073 - val_loss: 0.0076
Epoch 25/100
391/391 ————— 10s 14ms/step - loss: 0.0072 - val_loss: 0.0081
Epoch 26/100
391/391 ————— 5s 13ms/step - loss: 0.0071 - val_loss: 0.0072
Epoch 27/100
391/391 ————— 5s 13ms/step - loss: 0.0070 - val_loss: 0.0074
Epoch 28/100
391/391 ————— 5s 13ms/step - loss: 0.0069 - val_loss: 0.0077
Epoch 29/100
391/391 ————— 5s 13ms/step - loss: 0.0069 - val_loss: 0.0070
Epoch 30/100
391/391 ————— 5s 14ms/step - loss: 0.0068 - val_loss: 0.0073
Epoch 31/100
391/391 ————— 10s 14ms/step - loss: 0.0067 - val_loss: 0.0067
Epoch 32/100
391/391 ————— 5s 13ms/step - loss: 0.0067 - val_loss: 0.0070
Epoch 33/100
391/391 ————— 5s 12ms/step - loss: 0.0066 - val_loss: 0.0080
Epoch 34/100
391/391 ————— 6s 14ms/step - loss: 0.0067 - val_loss: 0.0067
Epoch 35/100
391/391 ————— 5s 13ms/step - loss: 0.0066 - val_loss: 0.0066
Epoch 36/100
391/391 ————— 5s 13ms/step - loss: 0.0065 - val_loss: 0.0078
Epoch 37/100
391/391 ————— 10s 13ms/step - loss: 0.0065 - val_loss: 0.0070
Epoch 38/100
391/391 ————— 10s 13ms/step - loss: 0.0064 - val_loss: 0.0061
Epoch 39/100
391/391 ————— 10s 13ms/step - loss: 0.0064 - val_loss: 0.0065
Epoch 40/100

391/391 — 5s 13ms/step - loss: 0.0063 - val_loss: 0.0072
Epoch 41/100
391/391 — 5s 13ms/step - loss: 0.0063 - val_loss: 0.0061
Epoch 42/100
391/391 — 10s 14ms/step - loss: 0.0062 - val_loss: 0.0064
Epoch 43/100
391/391 — 10s 14ms/step - loss: 0.0062 - val_loss: 0.0060
Epoch 44/100
391/391 — 10s 13ms/step - loss: 0.0061 - val_loss: 0.0066
Epoch 45/100
391/391 — 5s 13ms/step - loss: 0.0062 - val_loss: 0.0060
Epoch 46/100
391/391 — 5s 13ms/step - loss: 0.0061 - val_loss: 0.0062
Epoch 47/100
391/391 — 5s 13ms/step - loss: 0.0061 - val_loss: 0.0060
Epoch 48/100
391/391 — 5s 14ms/step - loss: 0.0060 - val_loss: 0.0060
Epoch 49/100
391/391 — 5s 13ms/step - loss: 0.0060 - val_loss: 0.0060
Epoch 50/100
391/391 — 5s 13ms/step - loss: 0.0060 - val_loss: 0.0062
Epoch 51/100
391/391 — 5s 13ms/step - loss: 0.0059 - val_loss: 0.0057
Epoch 52/100
391/391 — 5s 13ms/step - loss: 0.0058 - val_loss: 0.0059
Epoch 53/100
391/391 — 10s 14ms/step - loss: 0.0059 - val_loss: 0.0061
Epoch 54/100
391/391 — 10s 13ms/step - loss: 0.0059 - val_loss: 0.0057
Epoch 55/100
391/391 — 10s 13ms/step - loss: 0.0058 - val_loss: 0.0055
Epoch 56/100
391/391 — 5s 13ms/step - loss: 0.0058 - val_loss: 0.0058
Epoch 57/100
391/391 — 10s 13ms/step - loss: 0.0057 - val_loss: 0.0057
Epoch 58/100
391/391 — 5s 13ms/step - loss: 0.0057 - val_loss: 0.0054
Epoch 59/100
391/391 — 5s 13ms/step - loss: 0.0057 - val_loss: 0.0059
Epoch 60/100
391/391 — 6s 14ms/step - loss: 0.0057 - val_loss: 0.0059
Epoch 61/100
391/391 — 5s 13ms/step - loss: 0.0057 - val_loss: 0.0057
Epoch 62/100
391/391 — 5s 13ms/step - loss: 0.0056 - val_loss: 0.0057
Epoch 63/100
391/391 — 5s 13ms/step - loss: 0.0056 - val_loss: 0.0062
Epoch 64/100
391/391 — 5s 12ms/step - loss: 0.0057 - val_loss: 0.0055
Epoch 65/100
391/391 — 6s 14ms/step - loss: 0.0055 - val_loss: 0.0054
Epoch 66/100
391/391 — 5s 13ms/step - loss: 0.0056 - val_loss: 0.0053
Epoch 67/100
391/391 — 6s 14ms/step - loss: 0.0055 - val_loss: 0.0053
Epoch 68/100
391/391 — 10s 13ms/step - loss: 0.0056 - val_loss: 0.0054
Epoch 69/100
391/391 — 5s 13ms/step - loss: 0.0055 - val_loss: 0.0054
Epoch 70/100
391/391 — 6s 14ms/step - loss: 0.0055 - val_loss: 0.0052
Epoch 71/100
391/391 — 10s 13ms/step - loss: 0.0055 - val_loss: 0.0055
Epoch 72/100
391/391 — 5s 13ms/step - loss: 0.0055 - val_loss: 0.0056
Epoch 73/100
391/391 — 10s 14ms/step - loss: 0.0055 - val_loss: 0.0053
Epoch 74/100
391/391 — 10s 14ms/step - loss: 0.0054 - val_loss: 0.0053
Epoch 75/100
391/391 — 5s 14ms/step - loss: 0.0054 - val_loss: 0.0052

391/391 5s 14ms/step - loss: 0.0054 - val_loss: 0.0052
 Epoch 76/100
 391/391 5s 13ms/step - loss: 0.0054 - val_loss: 0.0053
 Epoch 77/100
 391/391 5s 13ms/step - loss: 0.0054 - val_loss: 0.0056
 Epoch 78/100
 391/391 11s 14ms/step - loss: 0.0054 - val_loss: 0.0052
 Epoch 79/100
 391/391 10s 14ms/step - loss: 0.0053 - val_loss: 0.0053
 Epoch 80/100
 391/391 5s 14ms/step - loss: 0.0053 - val_loss: 0.0053
 313/313 3s 5ms/step



PSNR values:
 21.866875
 21.674416
 23.899395
 23.44033
 22.095594
 24.489351
 21.603481
 25.472778
 23.685562
 22.13042