

Assig2_Documentation

February 2, 2023

1 Documentation for Assignment (2)

This assignment is consists of 2 main codes to evaluate the Joint Bilateral Upsampling and the Iterative upsampling algorithms to enhance the disparity map from the added noise as well as getting the information from a high resolution image which is the RGB image to make the low resolution image which is disparity map to be upsampled to a high resolution one.

- A GUI is created to examine different sigma spatial and sigma spectral and as shown from the picture of the GUI; it is required to input 3 data which are the window size that affect the sigma spatial as sigma spatial is a function of window size. Also, it requires sigma spectral and output file name to save the produced images and the point clouds of JBU and IU.
- In order to run the first program to execute the two algorithms:

```
./HelloWorld_Exec (image_1 path) (image_2 path)
```

- If you need to enter new window size and sigma spectral, press “Esc” to repeat the program again.
- To run the code of computing the normals:

```
./surface_normal.py (radius of KDTreeSearch to compute normals)(number of neighbors)  
(path of the point cloud generated) (name of the output file with extension xyzn)
```

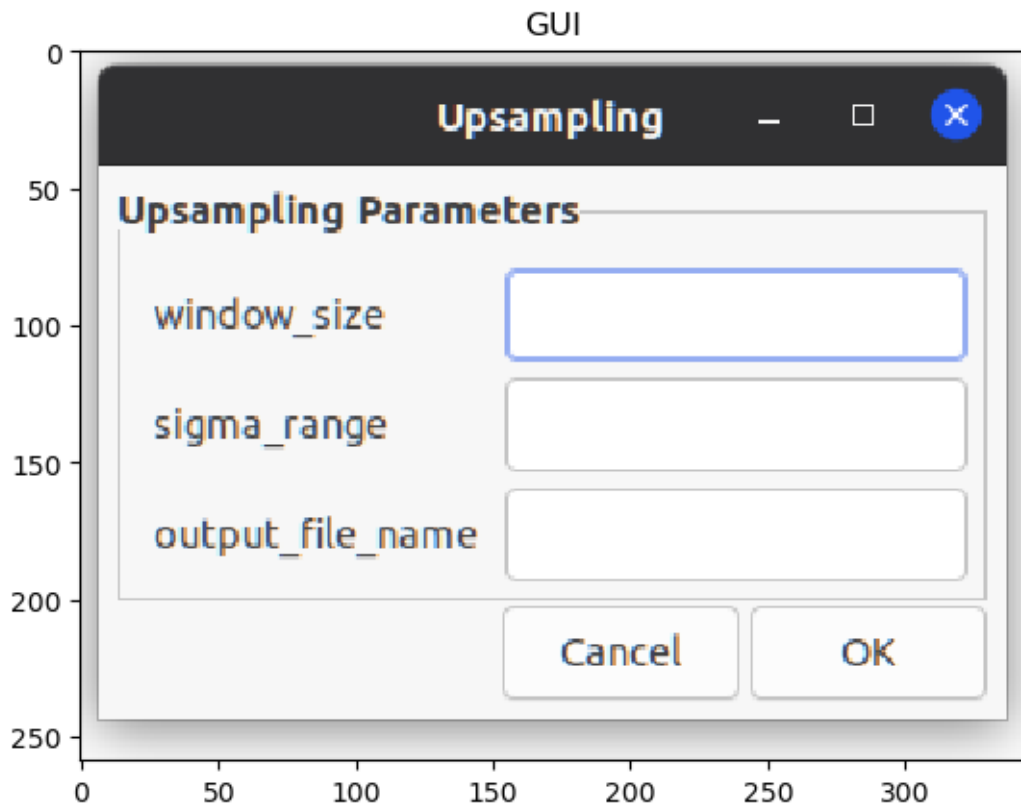
This documentation first includes the difference between the ground truth and the output from the JBU and the IU. It also includes evaluation of twelve different pairs of images of some metrics as Sum of squared difference, Normalized cross correlation, and Structural similarity index with different window sizes and also with different sigma spectral. Moreover, a comparison between the time taken in the JBU and the IU in each pair is included.

- Different window sizes are used with fixed sigma spectral which equals to 10, when the window size increases, the time taken increased and also the image got much blurry.
- But when trying different sigma spectral with fixed window size which equals to 5, there is no effect on the time taken but the error between the ground truth and the output was much smaller than using different window sizes.
- As observed that the JBU takes more time that the IU because the programming of JBU has a lot for loops and the IU is more compact. besides that, the output from the IU was much smoother but with a little bit blur in it.

Consequently, there are three files includes the point cloud and normals for pair 1, 4 and 12 which can be shown in meshlab.

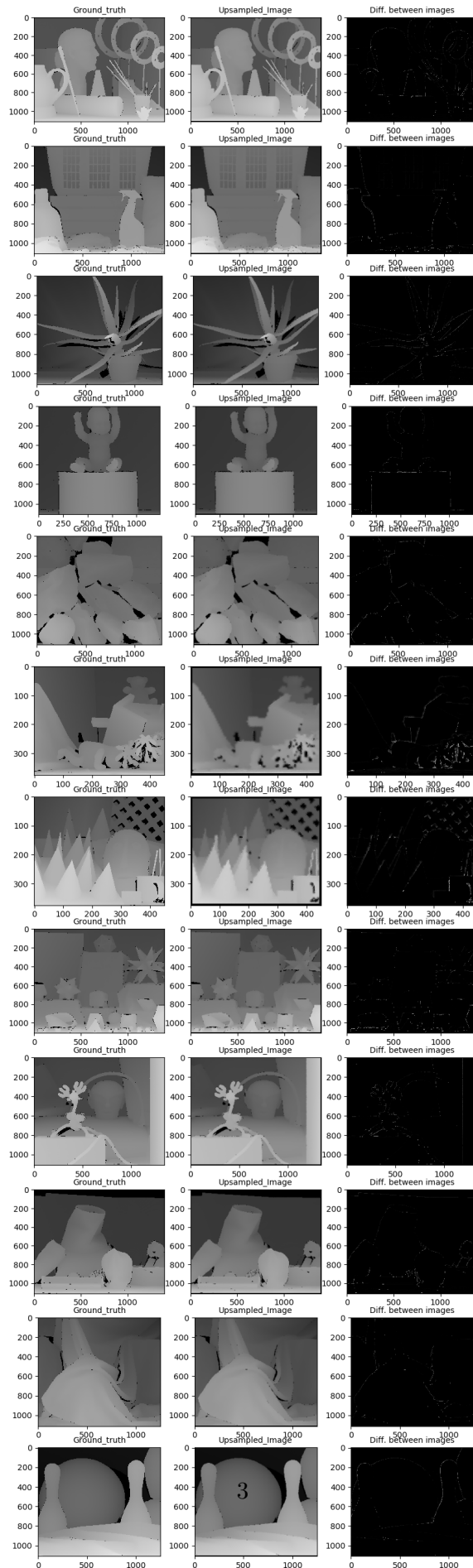
1.1 GUI Interface

```
Text(0.5, 1.0, 'GUI')
```



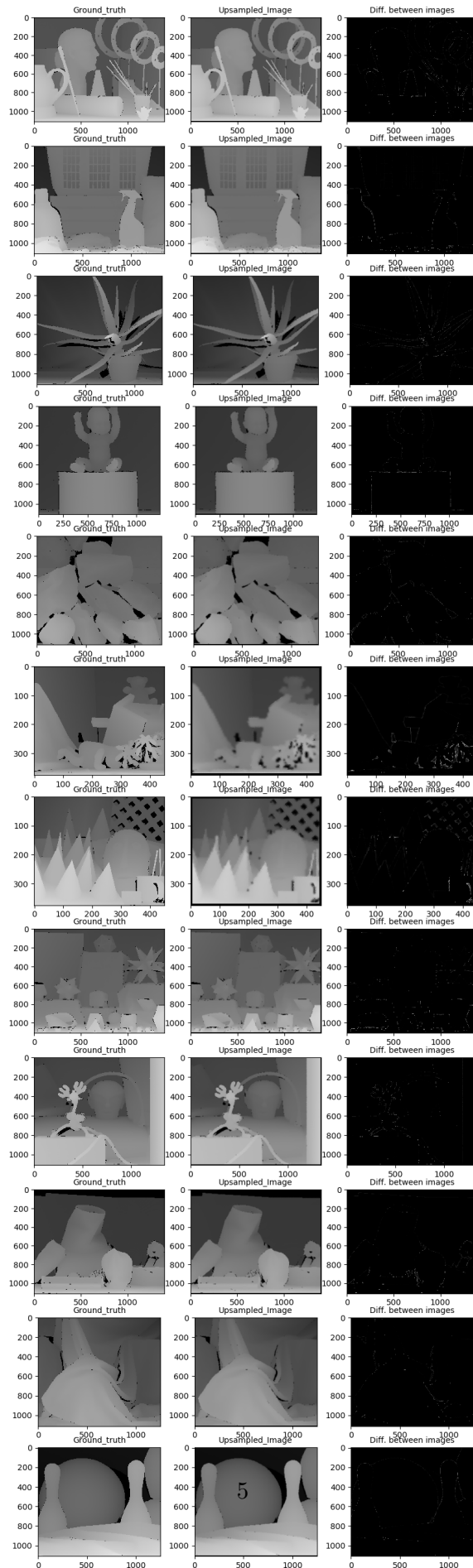
1.2 Joint Bilateral Upsampling

Difference between Output and the ground truth when window size is 11 and sigma spectral is 10



1.3 Iterative Upsampling

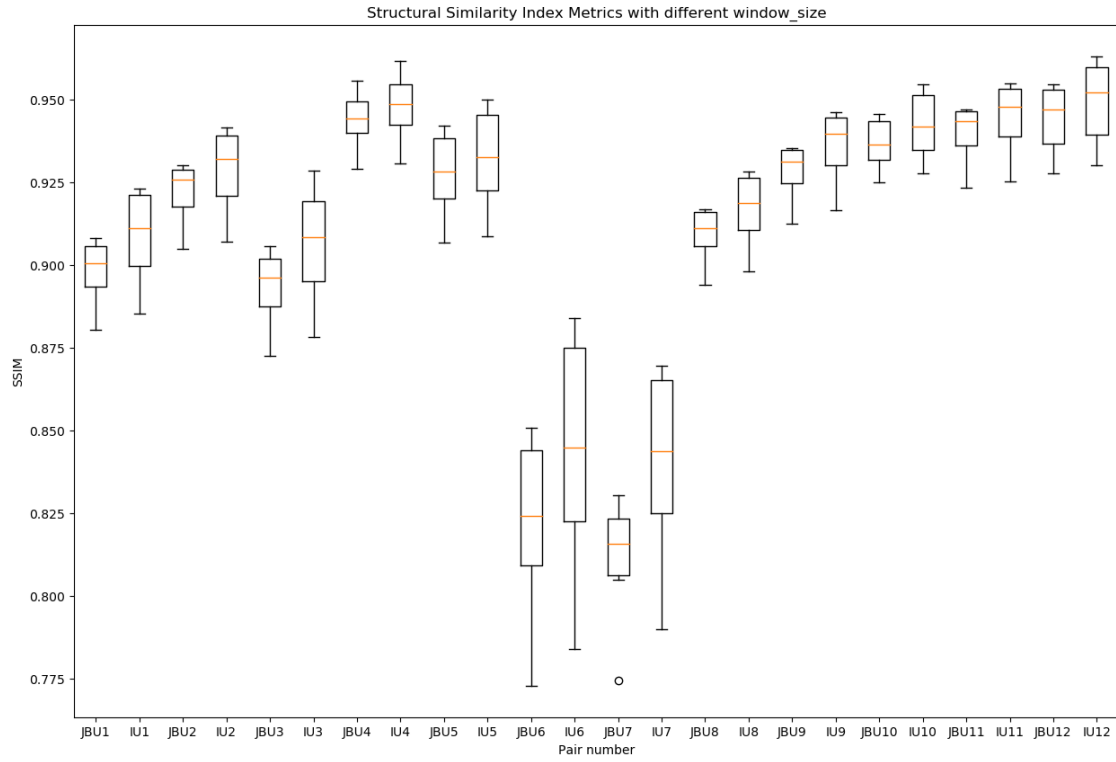
Difference between Output and the ground truth when window size is 11 and sigma spectral is 10

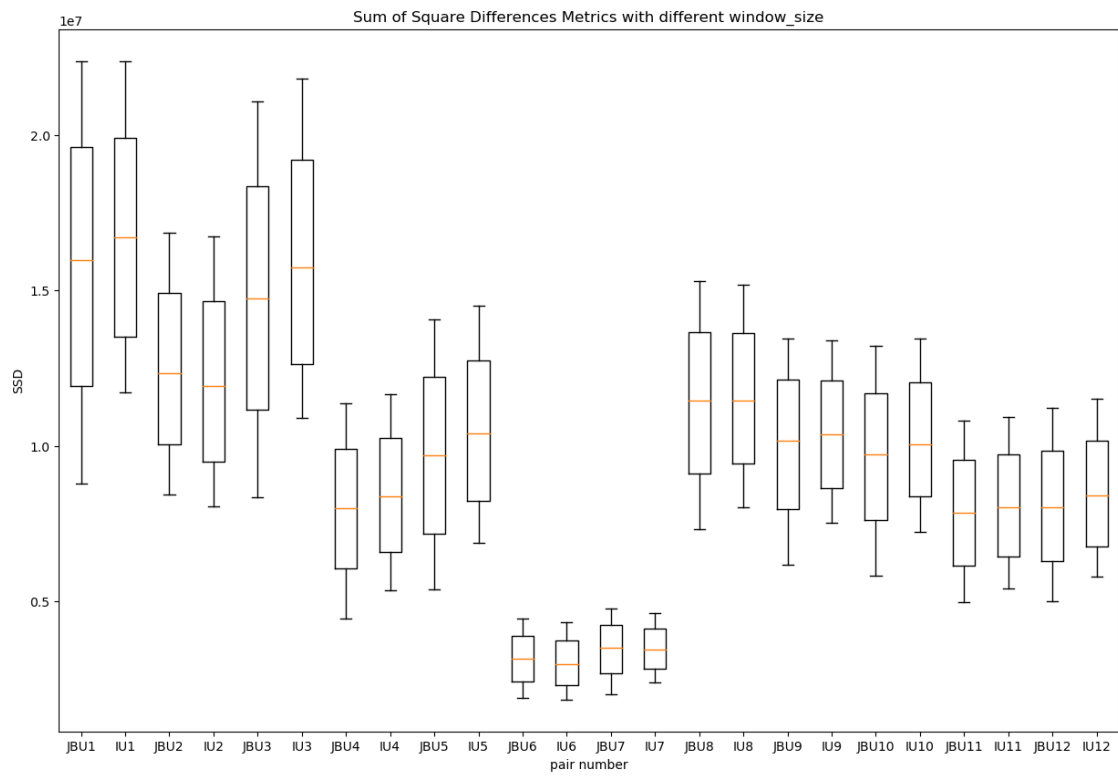
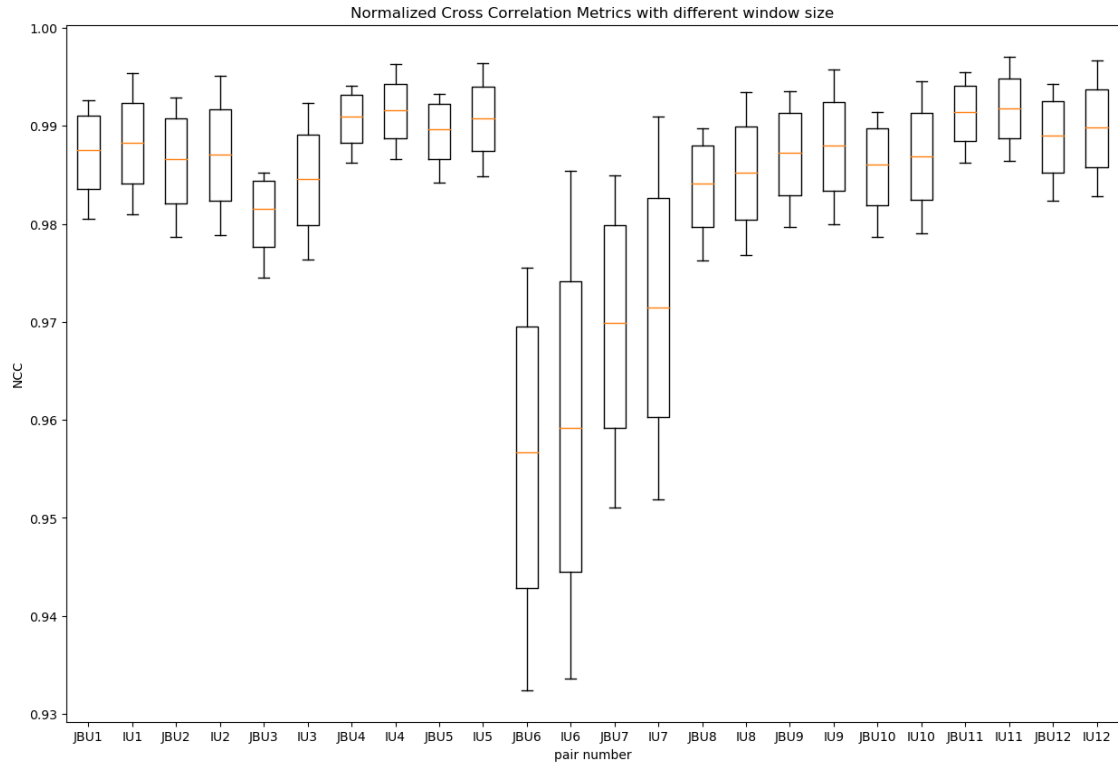


1.4 Metrics Comparison with different Sigma Spatial

As sigma spatial is function of the window_size so different window size is used.

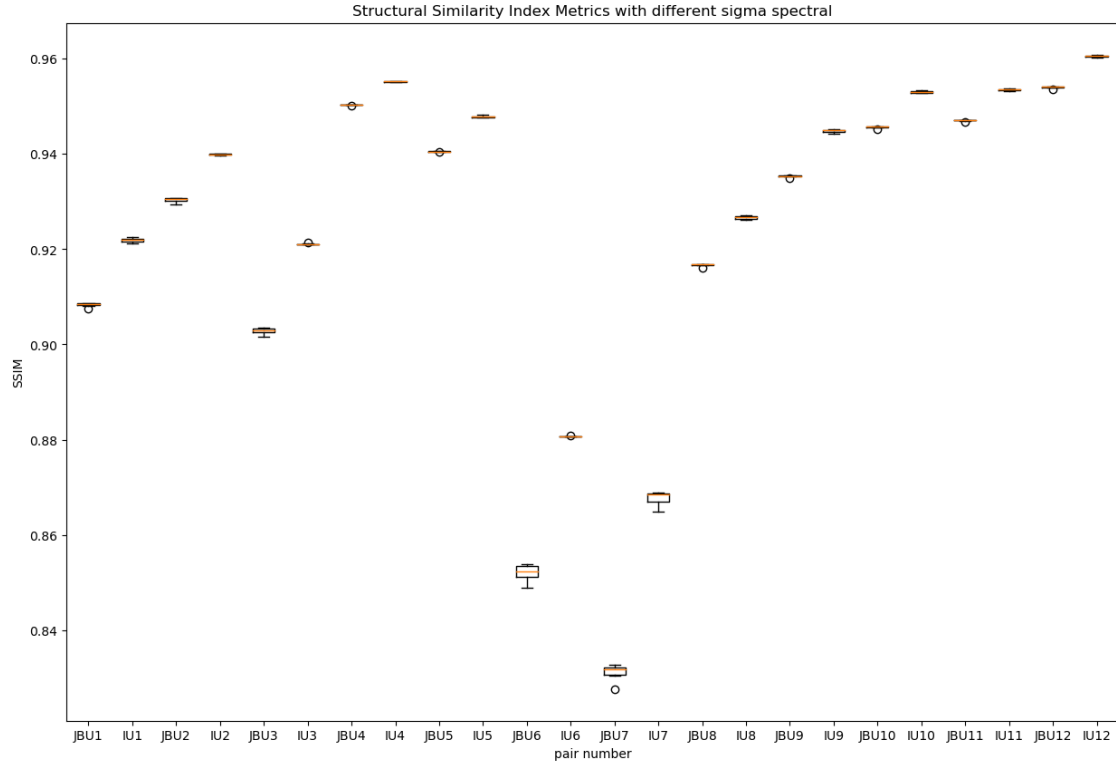
Window_Size used are 3,5,9,11,15,17

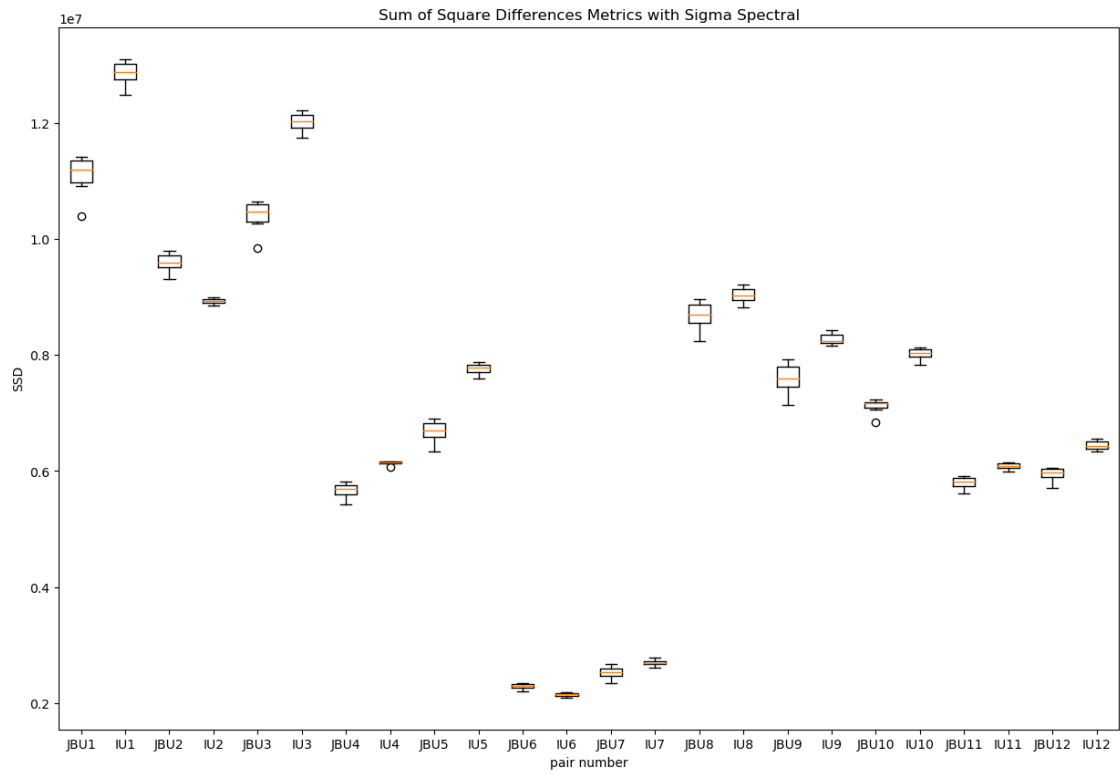
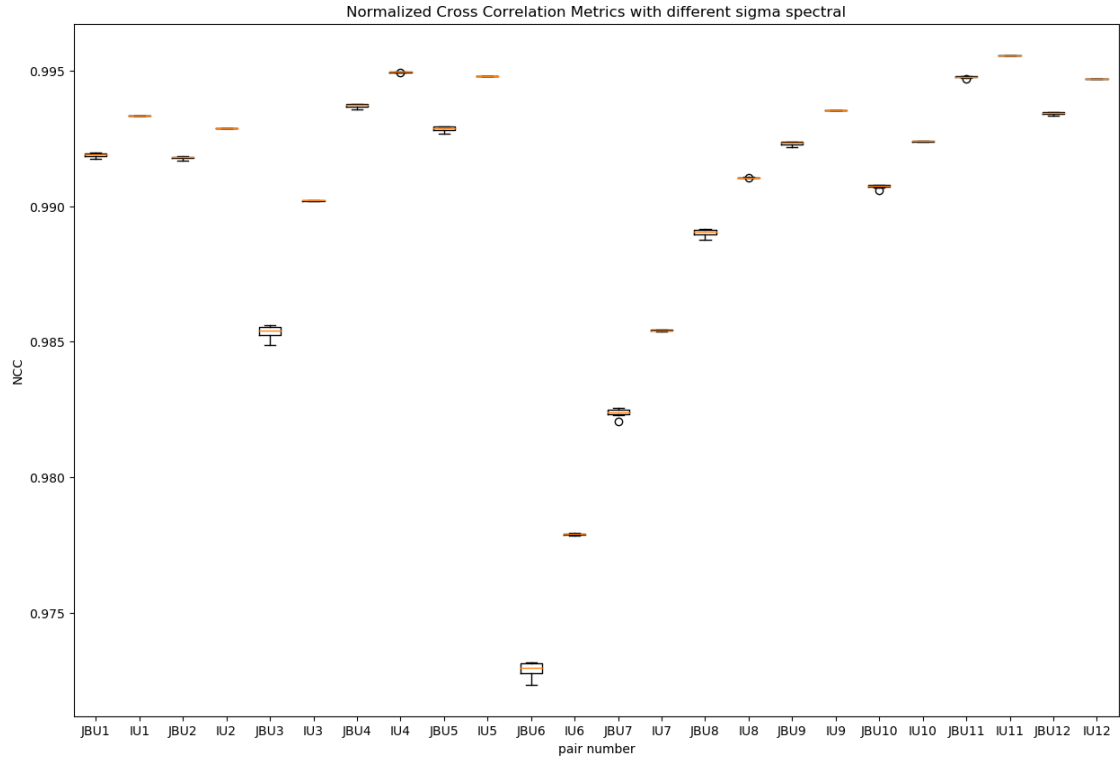




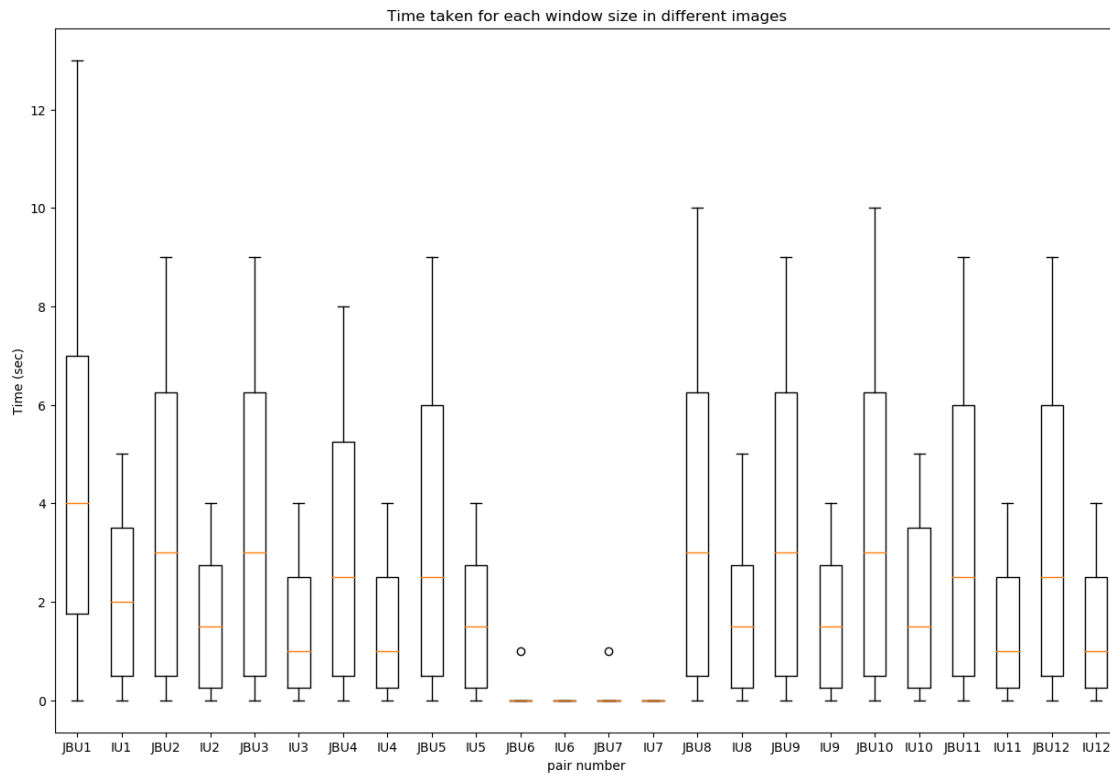
1.5 Metrics with different Sigma Spectral

Different sigma spectral are used which are 5,10,15,20,50,100

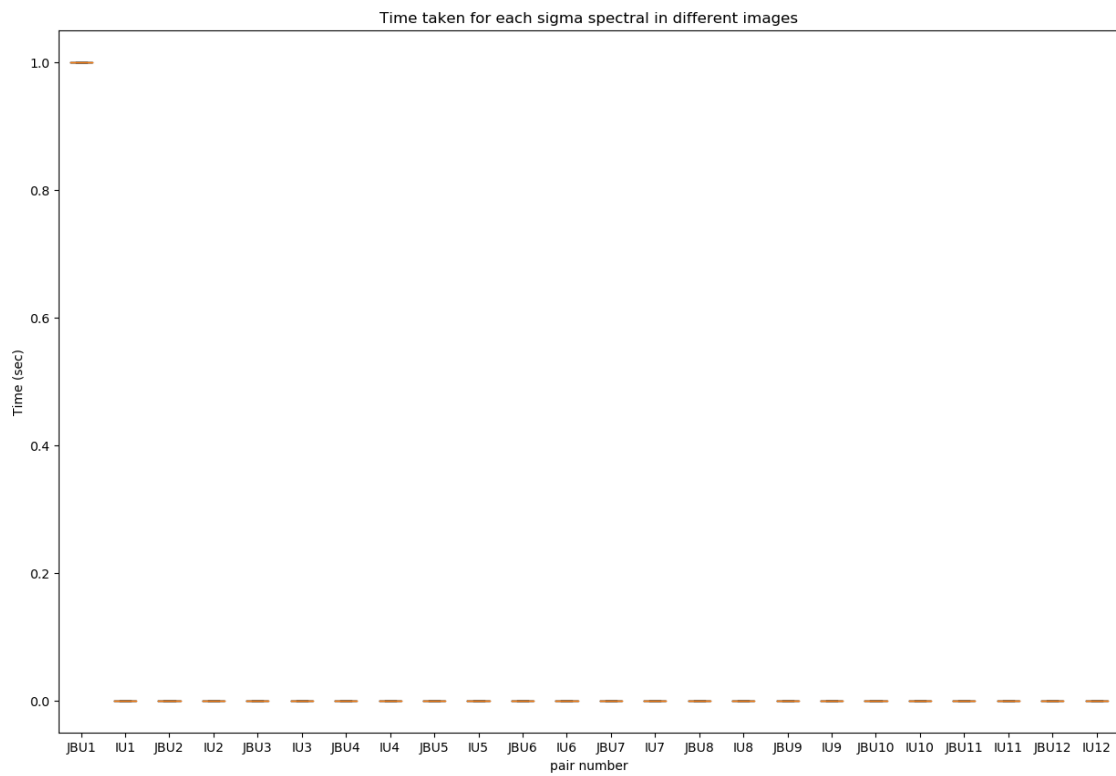




1.6 Time Processing for different Sigma Spatial

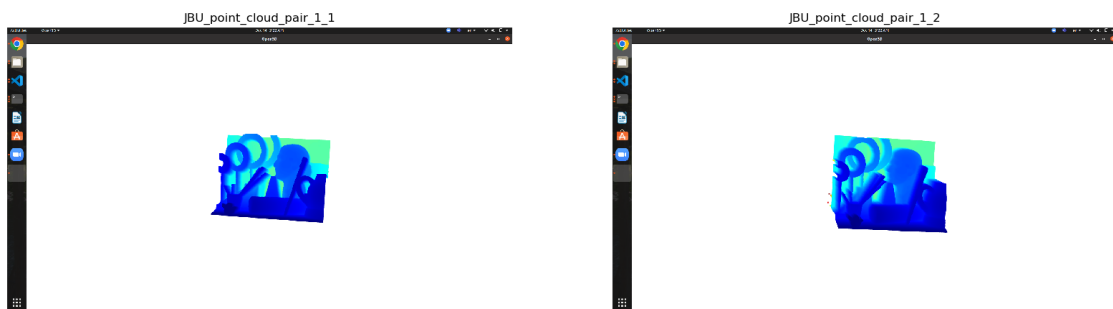


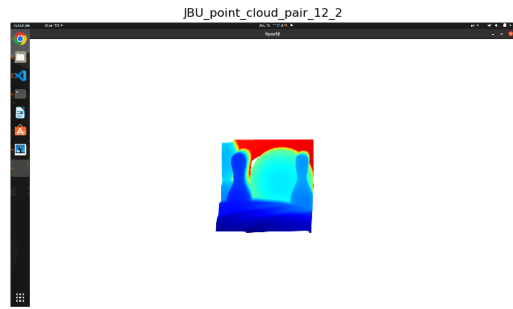
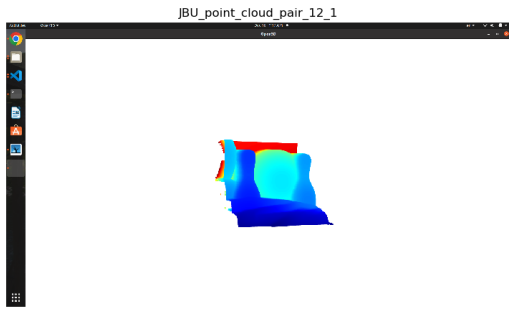
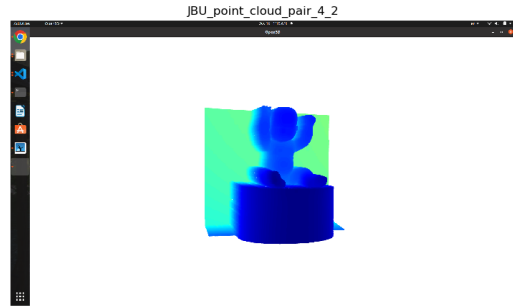
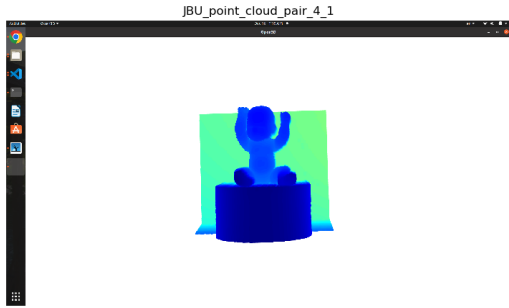
1.7 Time Processing for different Sigma Spectral



1.8 3D_Point Cloud Visualization for JBU

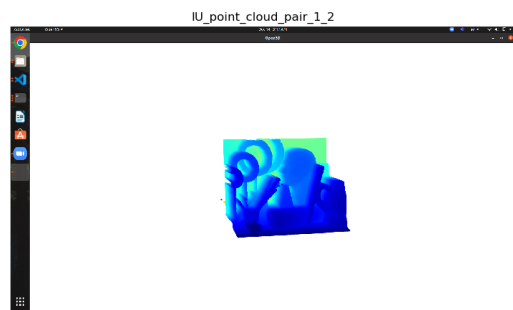
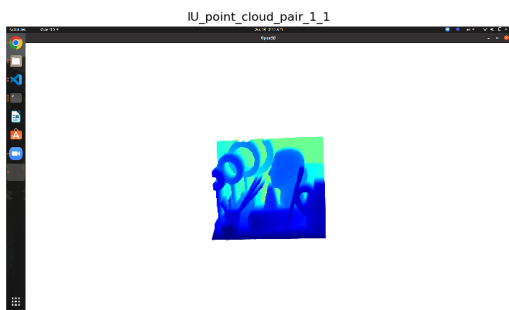
```
Text(0.5, 1.0, 'JBU_point_cloud_pair_12_2')
```

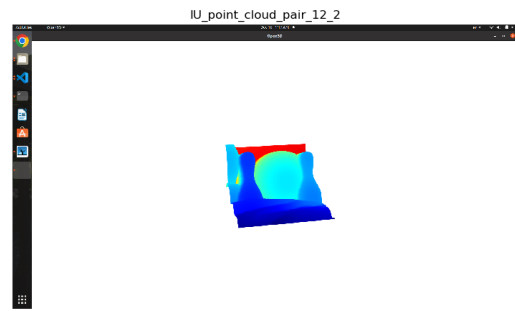
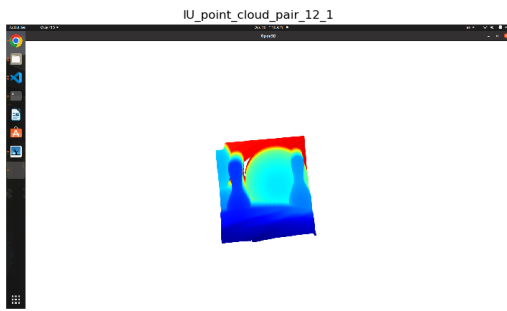
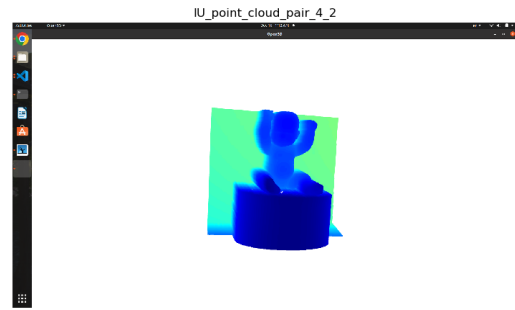
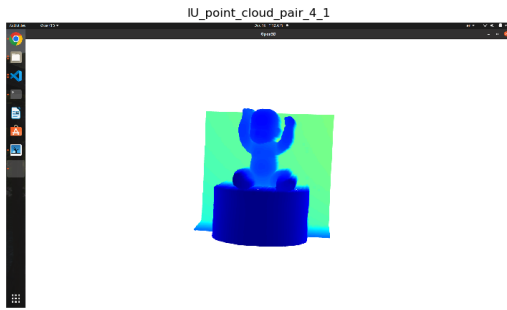




1.9 3D_Point Cloud Visualization for IU

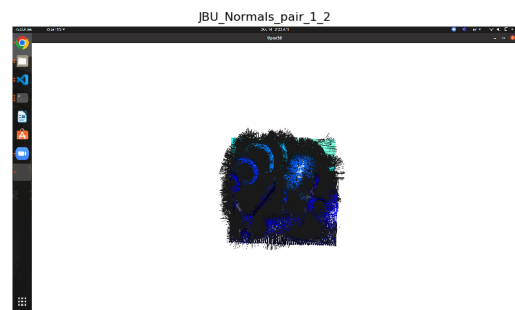
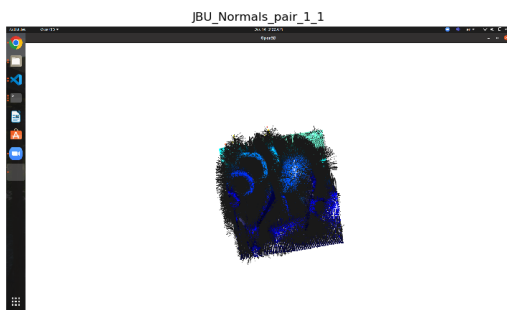
`Text(0.5, 1.0, 'IU_point_cloud_pair_12_2')`

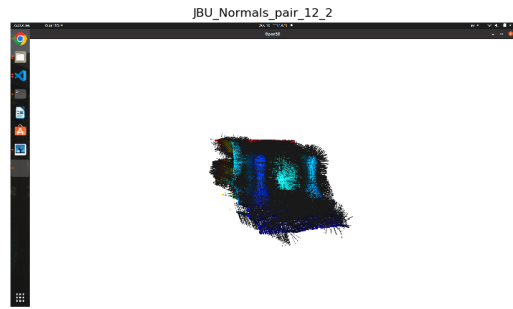
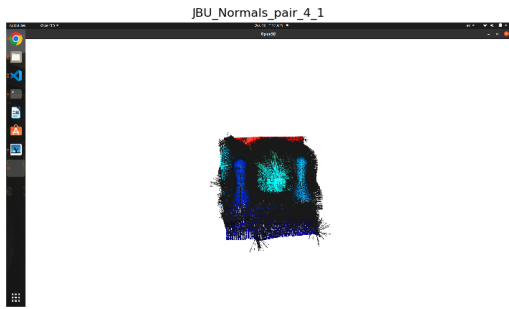
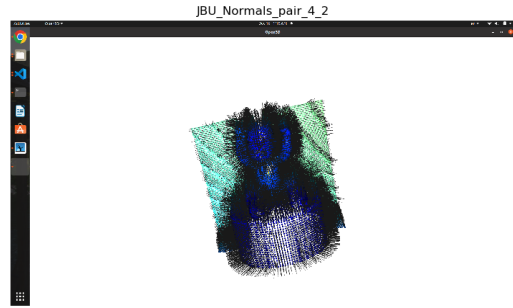
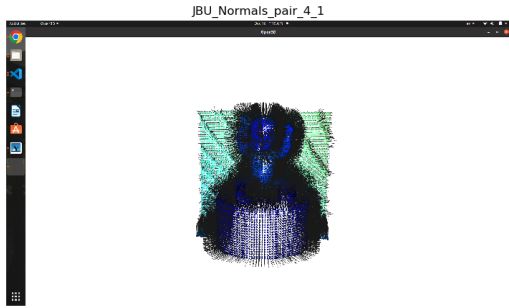




1.10 Surface Normal Visualization for JBU

`Text(0.5, 1.0, 'JBU_Normals_pair_12_2')`





1.11 Surface Normal Visualization for IU

`Text(0.5, 1.0, 'IU_Normals_pair_12_2')`

