



Cryo-Images Project

■ Cryo-image

■ First Dataset

- '*.dm3' cryo-images.
- '*.mrc' cryo-images.

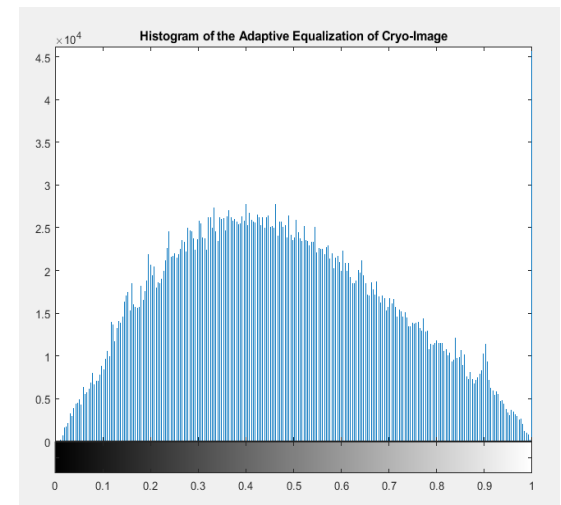
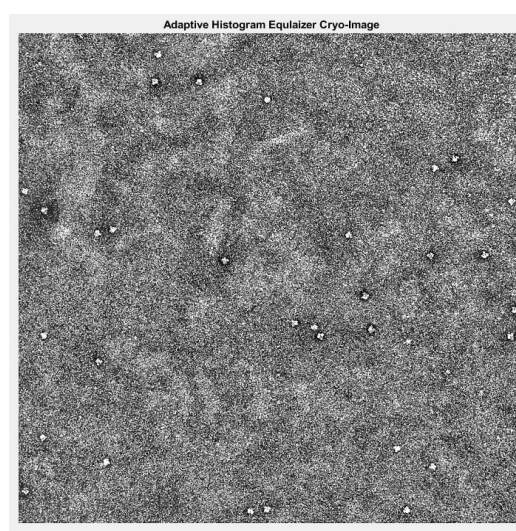
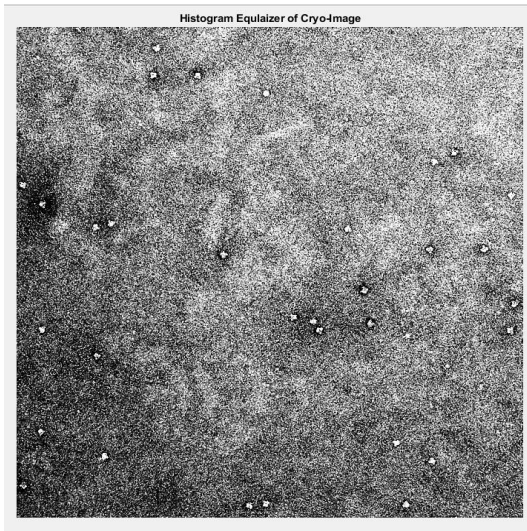
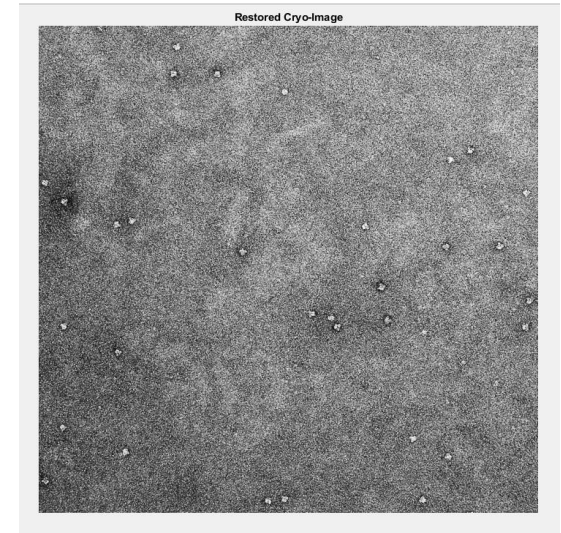
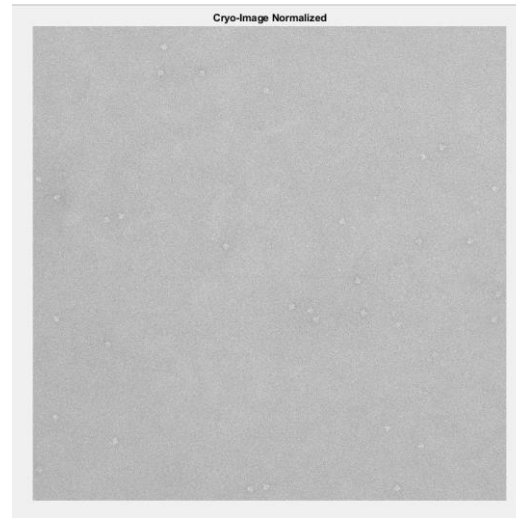


Image Normalization

- ALDH7A1_NAD_UF_B5_0035.tif

Cryo-Image Normalized

Normalized								
2048x2048 double								
	1	2	3	4	5	6	7	8
1	0.9956	0.9953	0.9951	0.9951	0.9950	0.9949	0.9945	0.9955
2	0.9947	0.9948	0.9942	0.9946	0.9947	0.9938	0.9934	0.9941
3	0.9944	0.9943	0.9941	0.9939	0.9939	0.9936	0.9934	0.9929
4	0.9947	0.9945	0.9942	0.9945	0.9950	0.9946	0.9943	0.9933
5	0.9944	0.9943	0.9942	0.9940	0.9949	0.9943	0.9949	0.9937
6	0.9944	0.9945	0.9952	0.9940	0.9944	0.9945	0.9952	0.9947
7	0.9943	0.9948	0.9950	0.9942	0.9948	0.9955	0.9953	0.9952
8	0.9945	0.9951	0.9944	0.9945	0.9944	0.9954	0.9960	0.9955
9	0.9953	0.9950	0.9940	0.9943	0.9944	0.9946	0.9955	0.9950
10	0.9947	0.9943	0.9936	0.9933	0.9937	0.9948	0.9951	0.9955
11	0.9943	0.9938	0.9942	0.9937	0.9941	0.9950	0.9960	0.9972
12	0.9946	0.9941	0.9948	0.9950	0.9945	0.9950	0.9954	0.9958
13	0.9957	0.9950	0.9953	0.9957	0.9951	0.9947	0.9954	0.9946
14	0.9967	0.9957	0.9950	0.9956	0.9961	0.9952	0.9954	0.9960
15	0.9960	0.9960	0.9954	0.9957	0.9964	0.9956	0.9956	0.9962
16	0.9947	0.9959	0.9961	0.9961	0.9965	0.9967	0.9963	0.9961
17	0.9961	0.9970	0.9971	0.9970	0.9967	0.9974	0.9964	0.9951
18	0.9974	0.9977	0.9975	0.9971	0.9964	0.9960	0.9960	0.9959
19	0.9971	0.9973	0.9970	0.9965	0.9958	0.9949	0.9946	0.9958
20	0.9961	0.9967	0.9962	0.9954	0.9956	0.9955	0.9947	0.9946
21	0.9951	0.9948	0.9955	0.9951	0.9953	0.9955	0.9950	0.9941
22	0.9949	0.9940	0.9946	0.9947	0.9951	0.9956	0.9955	0.9948

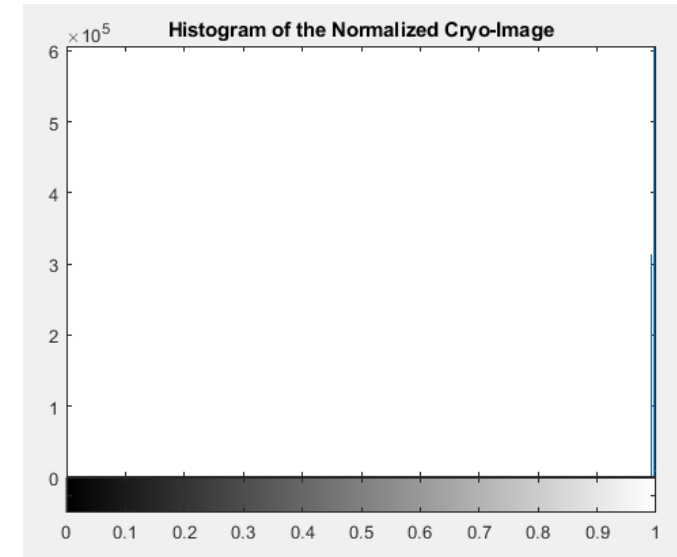
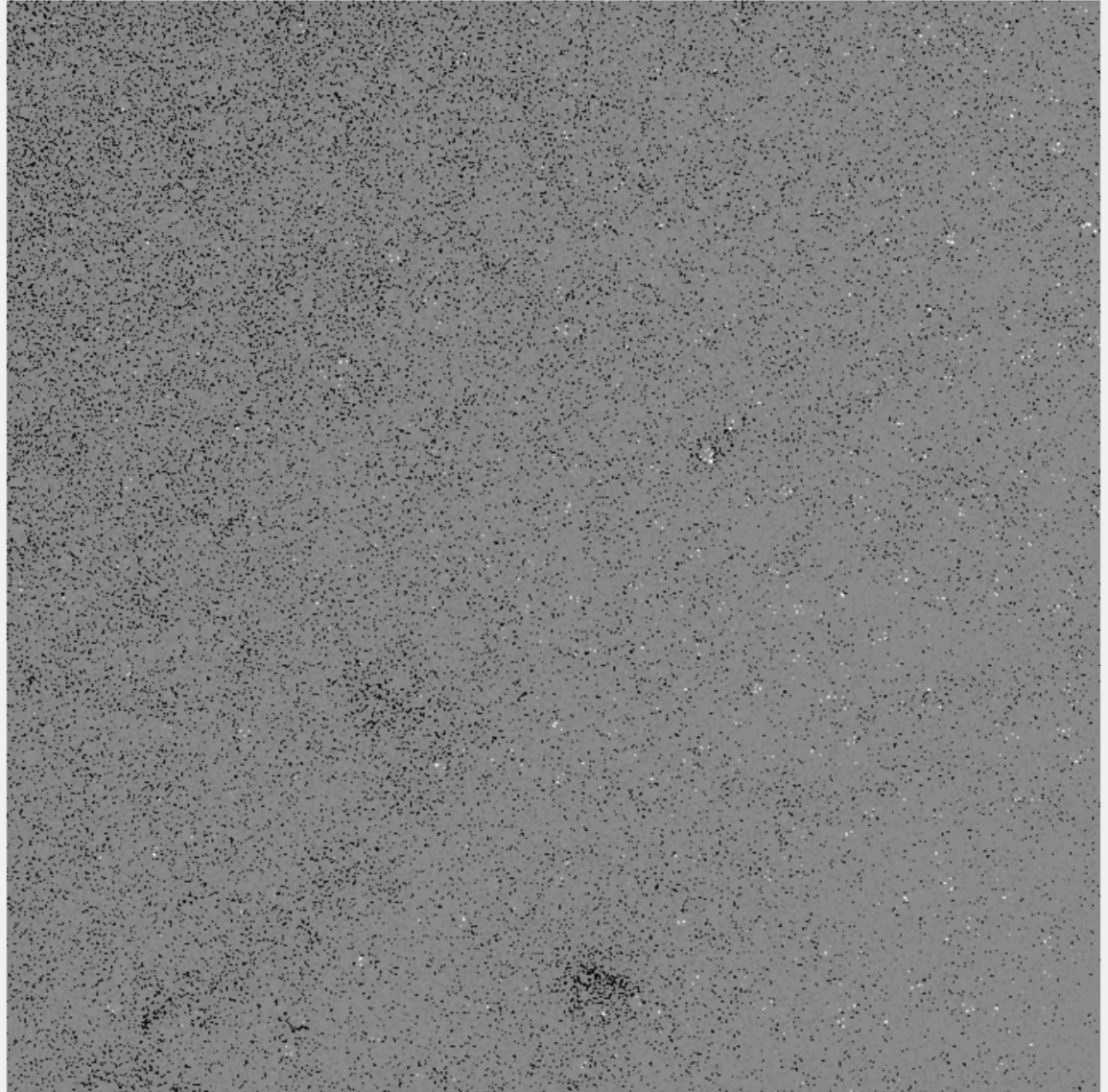


Image Restoration Using Wiener Filtering

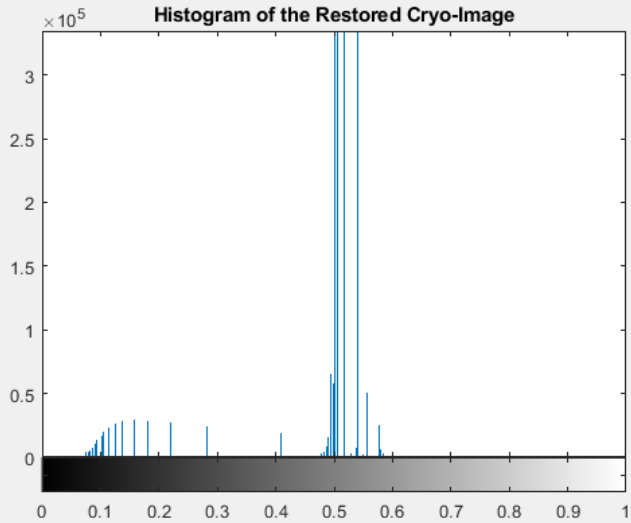
Cryo-Image Normalized



Restored Cryo-Image

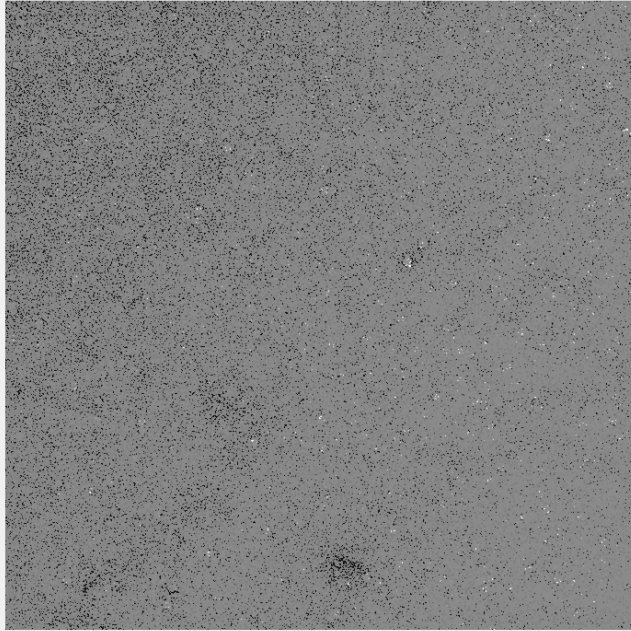


Histogram of the Restored Cryo-Image

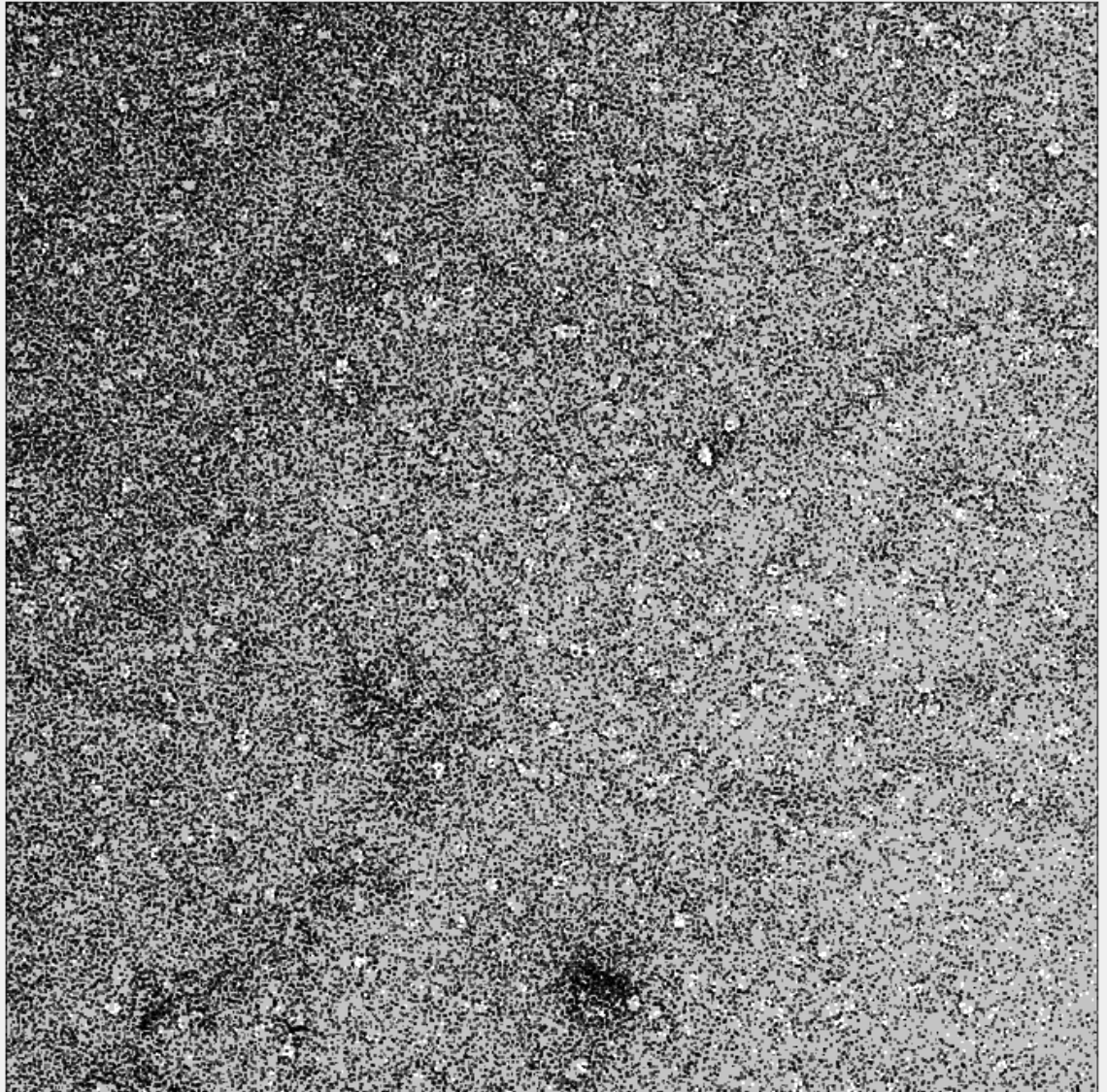


■ Histogram Equalization

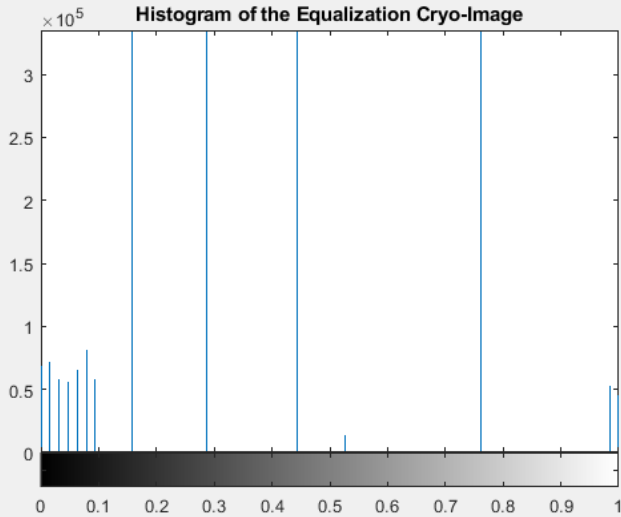
Restored Cryo-Image



Histogram Equalizer of Cryo-Image

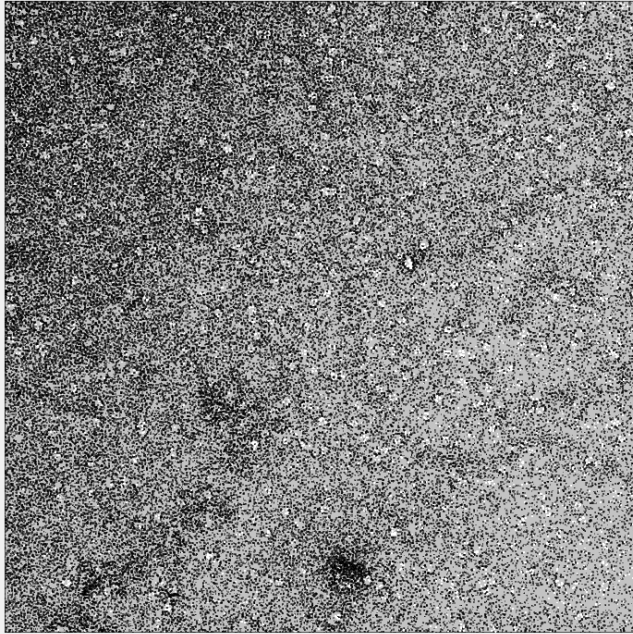


Histogram of the Equalization Cryo-Image

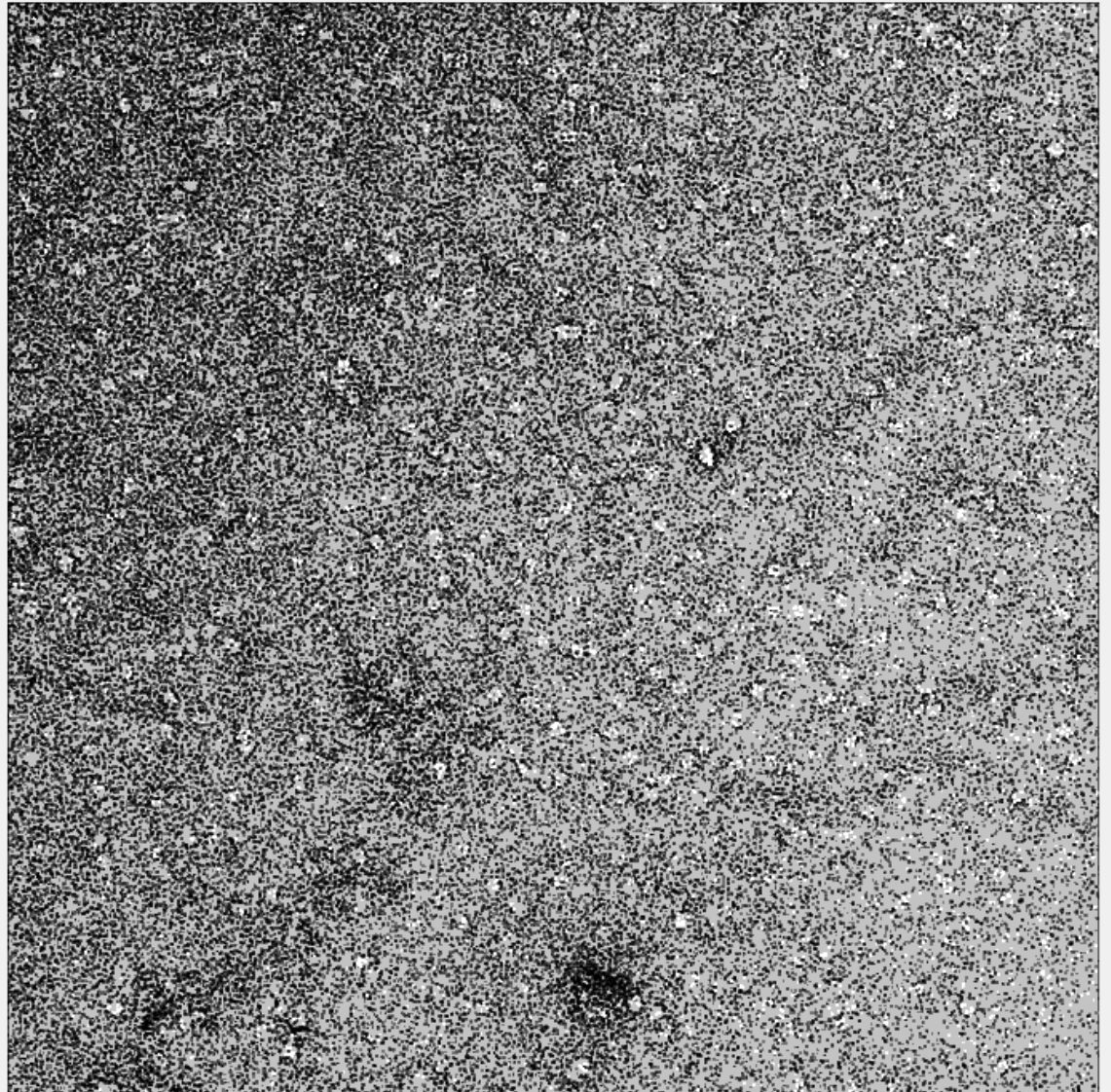


▪ Adaptive Histogram Equalization

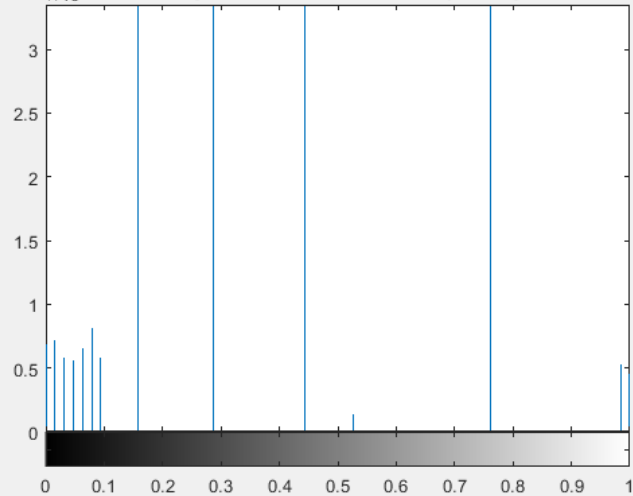
Histogram Equalizer of Cryo-Image



Adaptive Histogram Equalizer Cryo-Image



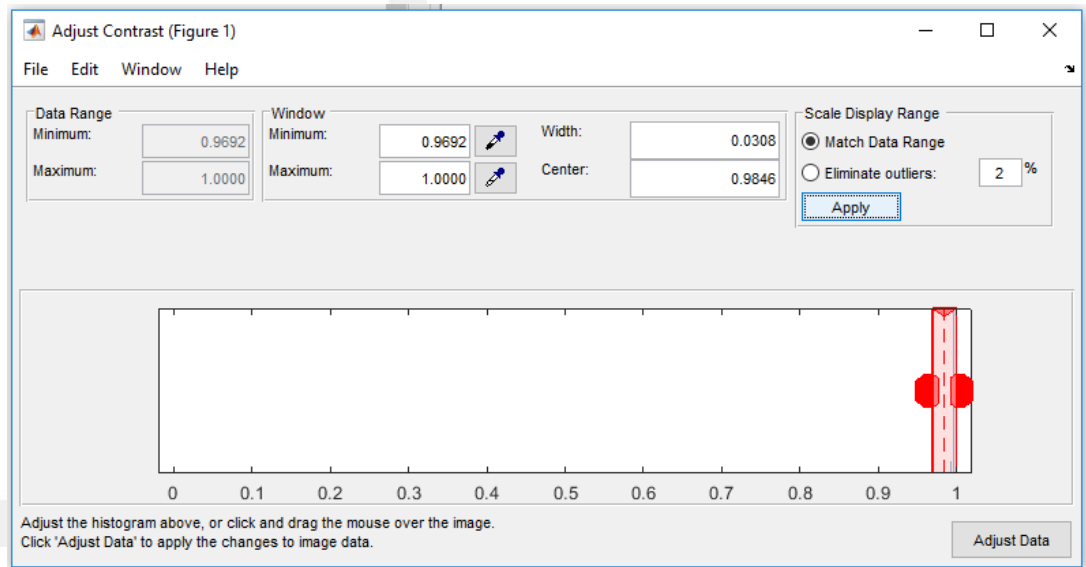
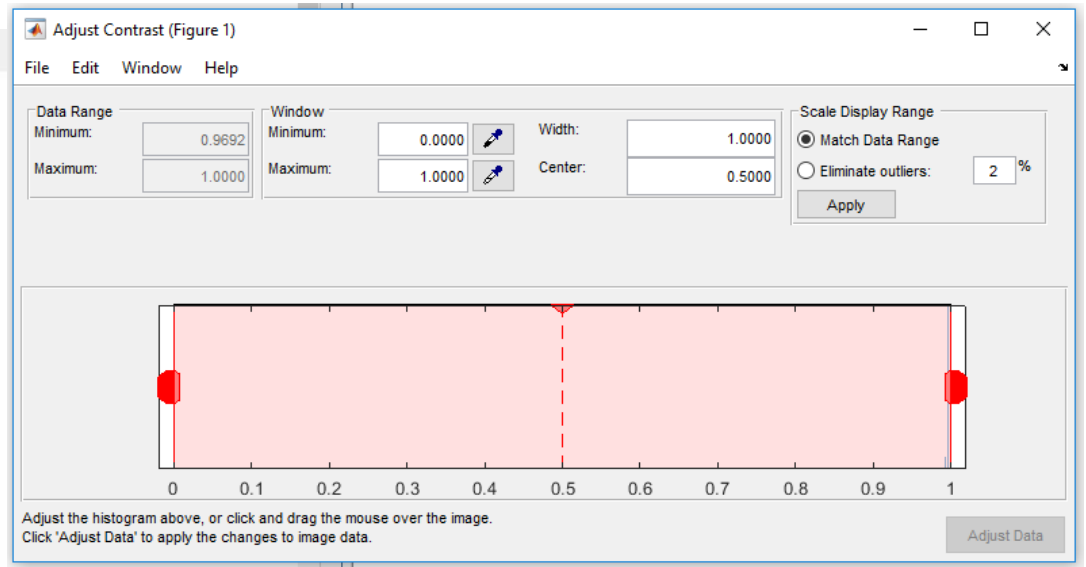
× 10⁵ Histogram of the Equalization Cryo-Image



■ Contrast Transfer Function (CTF) Issue

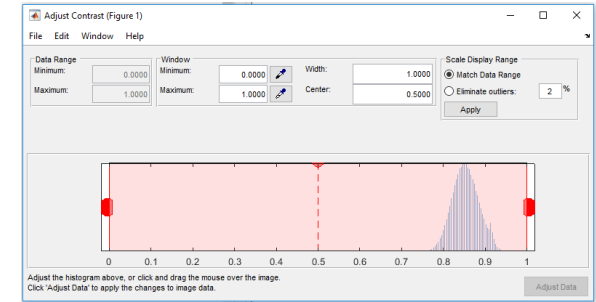
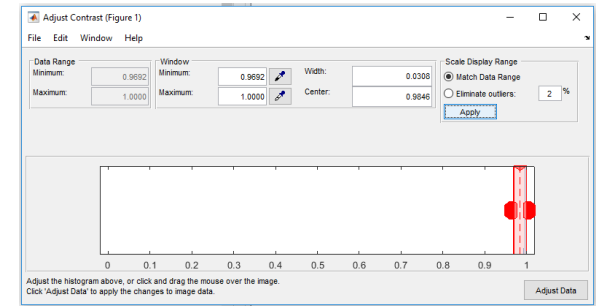
- Try to fig rout the CTF image issue

Normalized Cryo-Image



- Contrast Transfer Function (CTF) Issue
 - Eliminate the outliers from the (Data)

Normalized Cryo-Image



▪ Contrast Transfer Function (CTF) Issue

- Match the Data Range

Before Match the Data Range

Normalized Cryo-Image

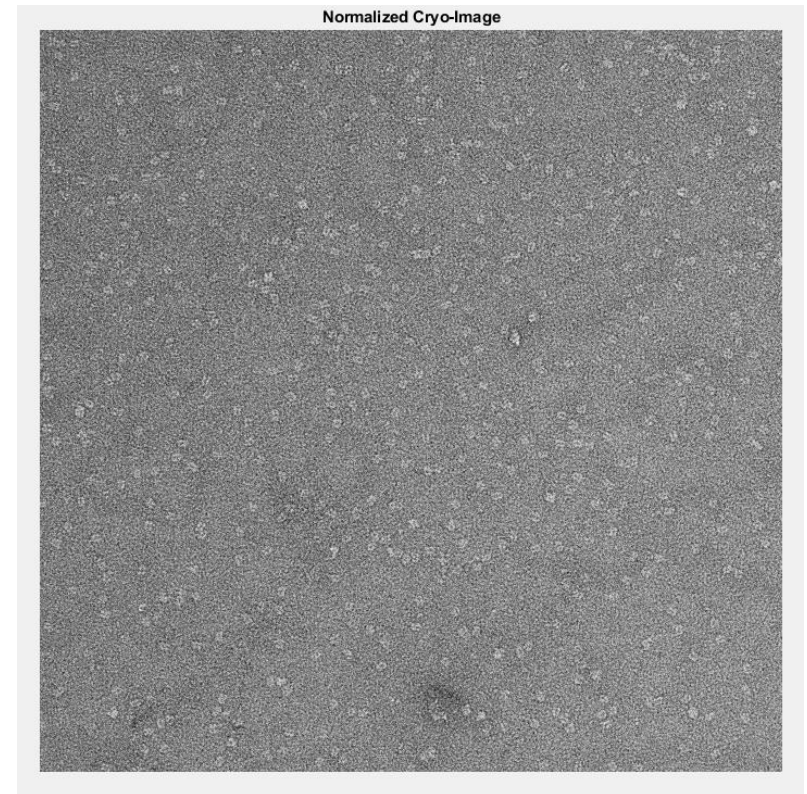
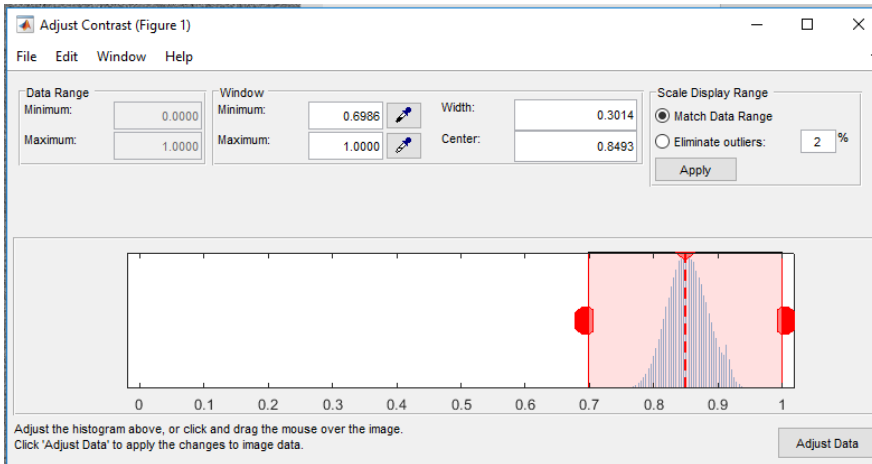
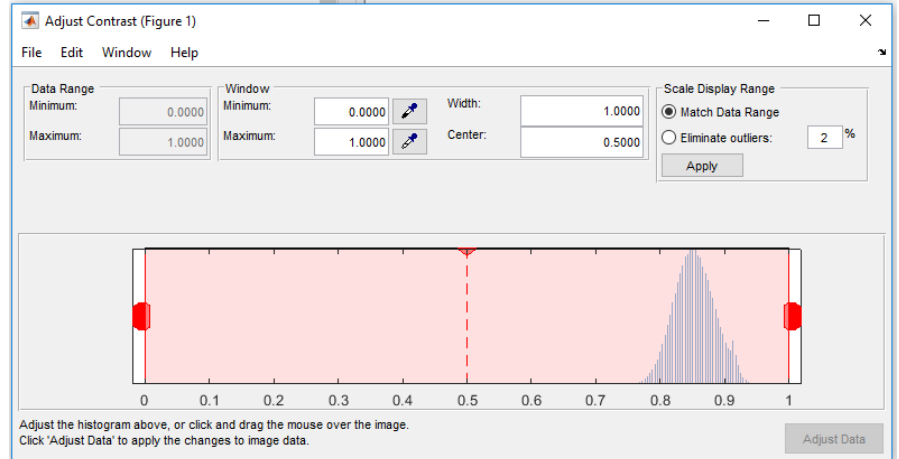
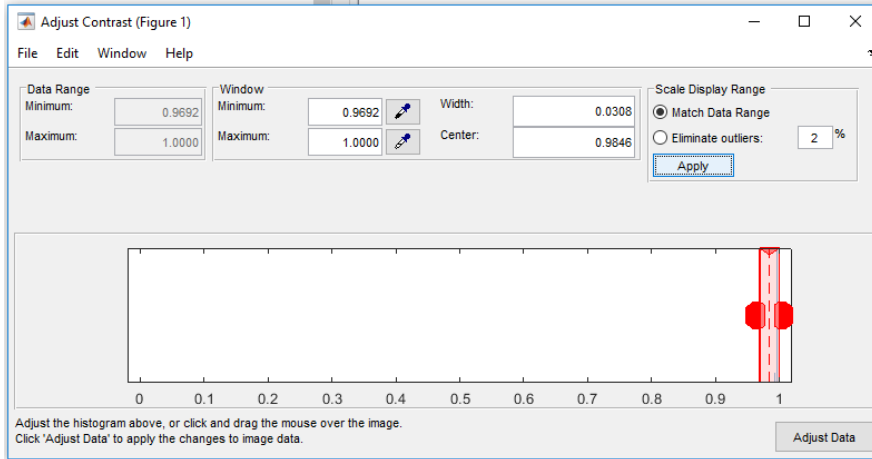


After Match the Data Range

Normalized Cryo-Image

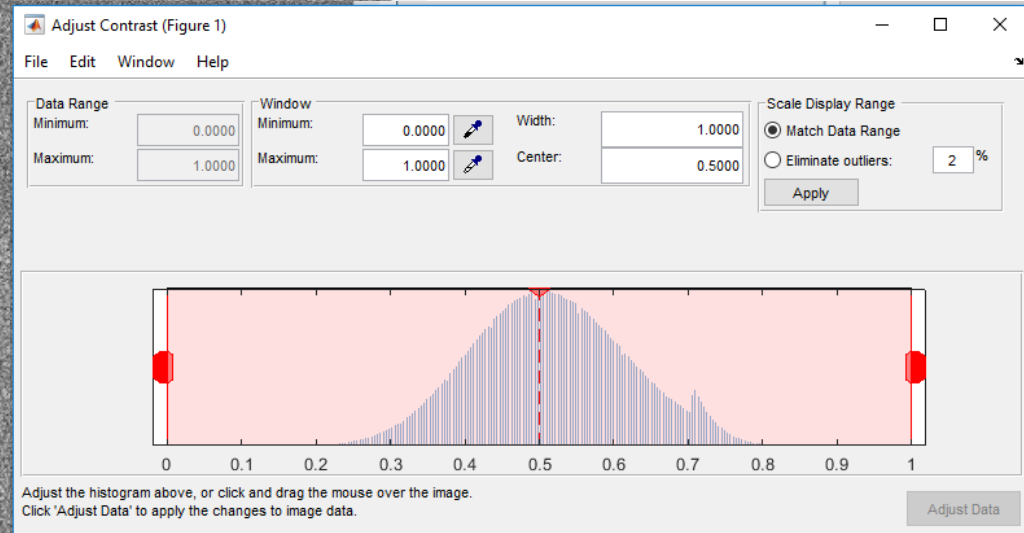
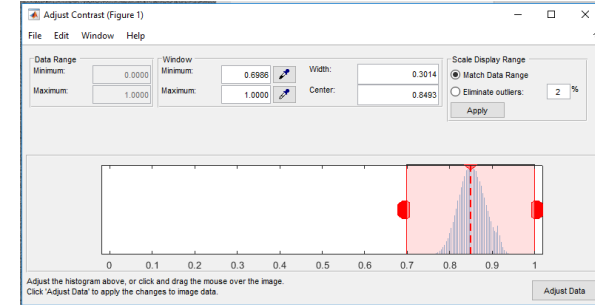
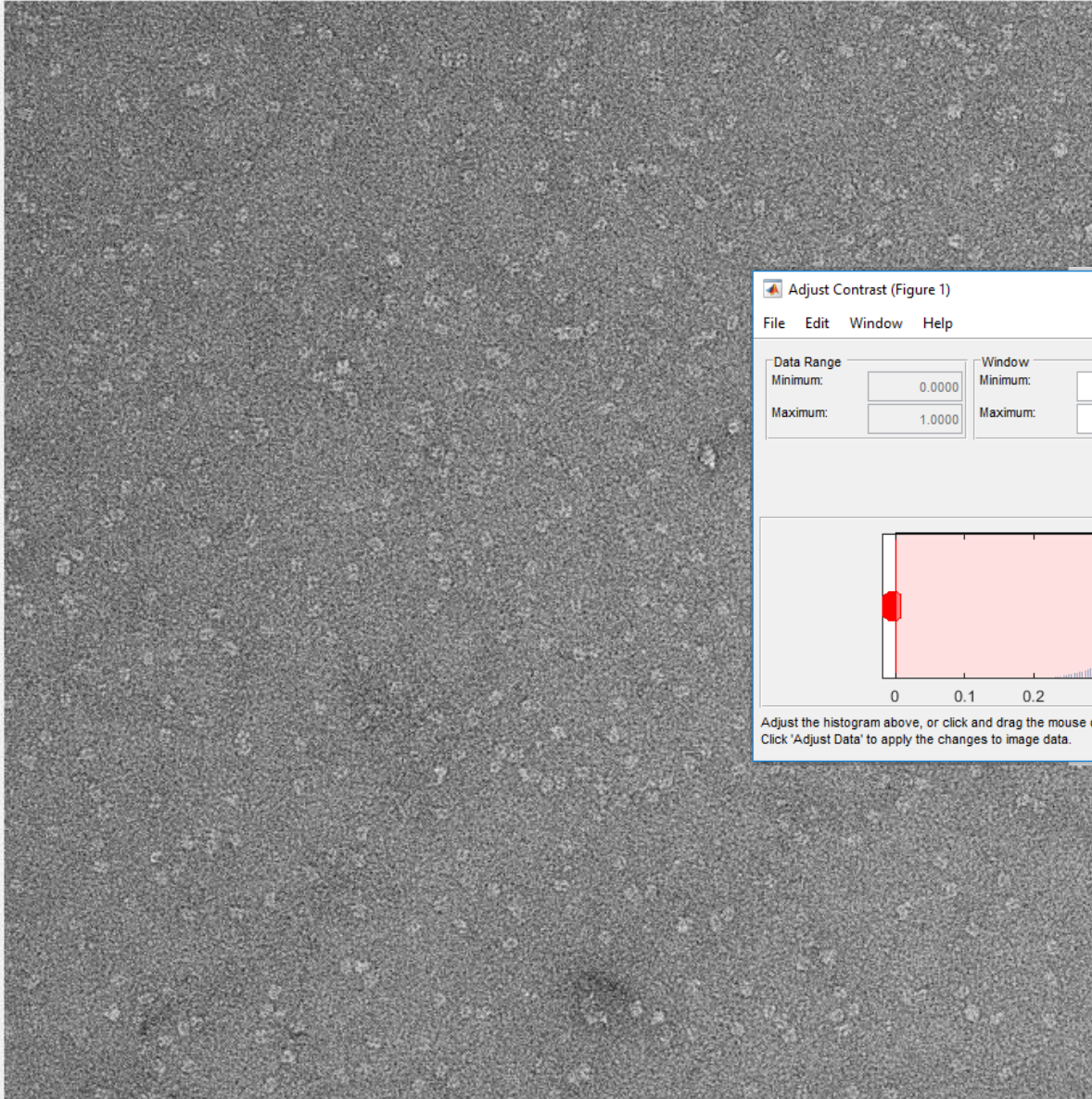


■ Contrast Transfer Function (CTF) Issue



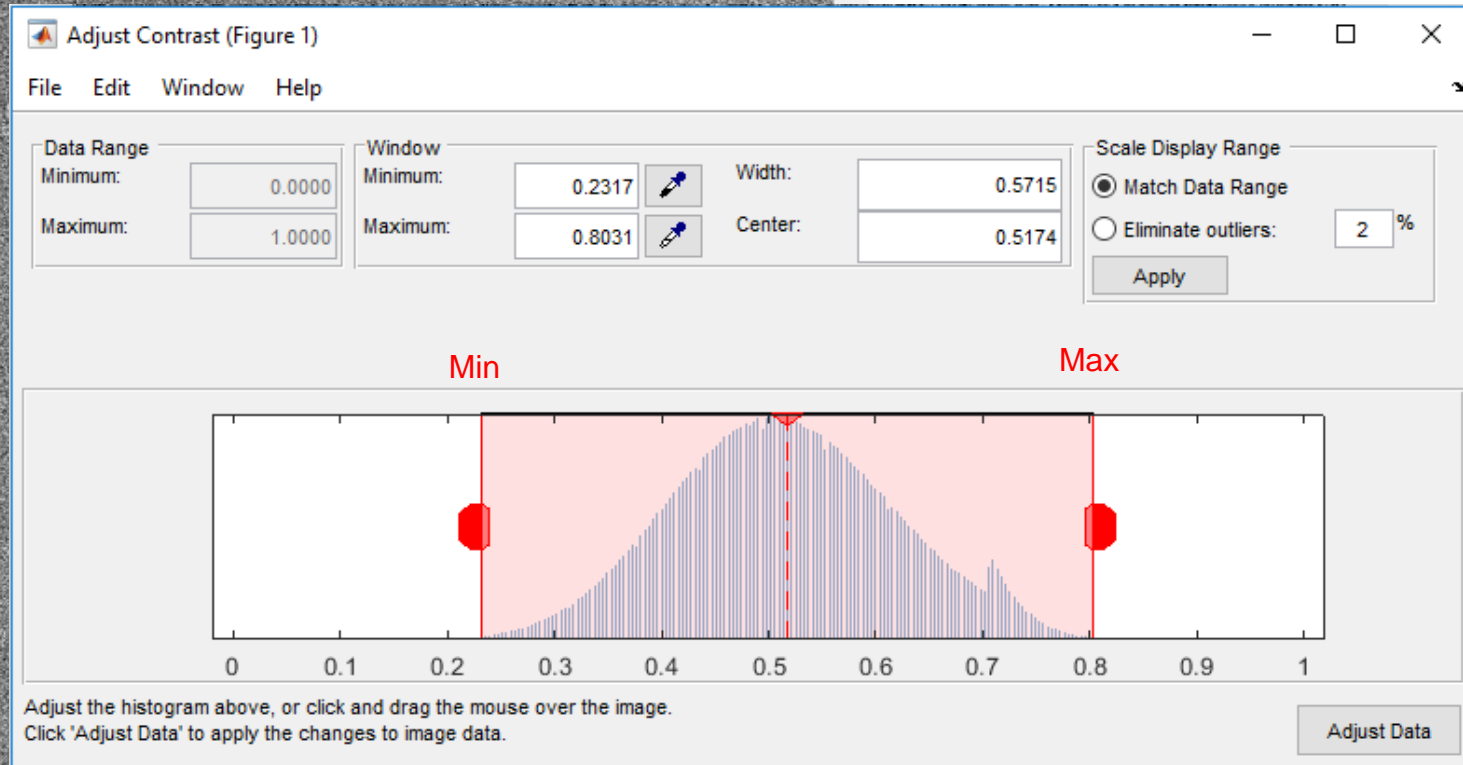
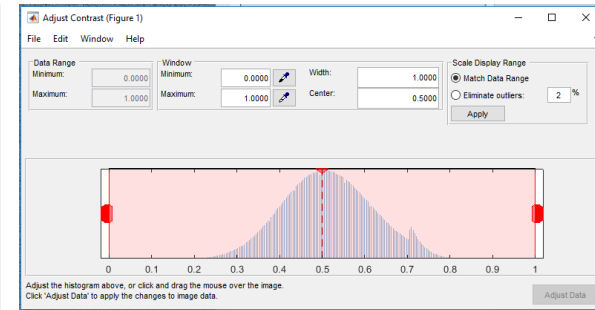
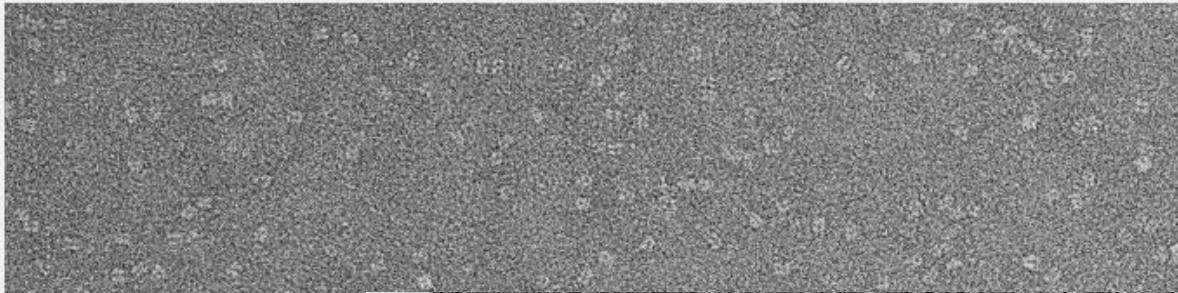
■ Contrast Transfer Function (CTF) Issue

Normalized Cryo-Image



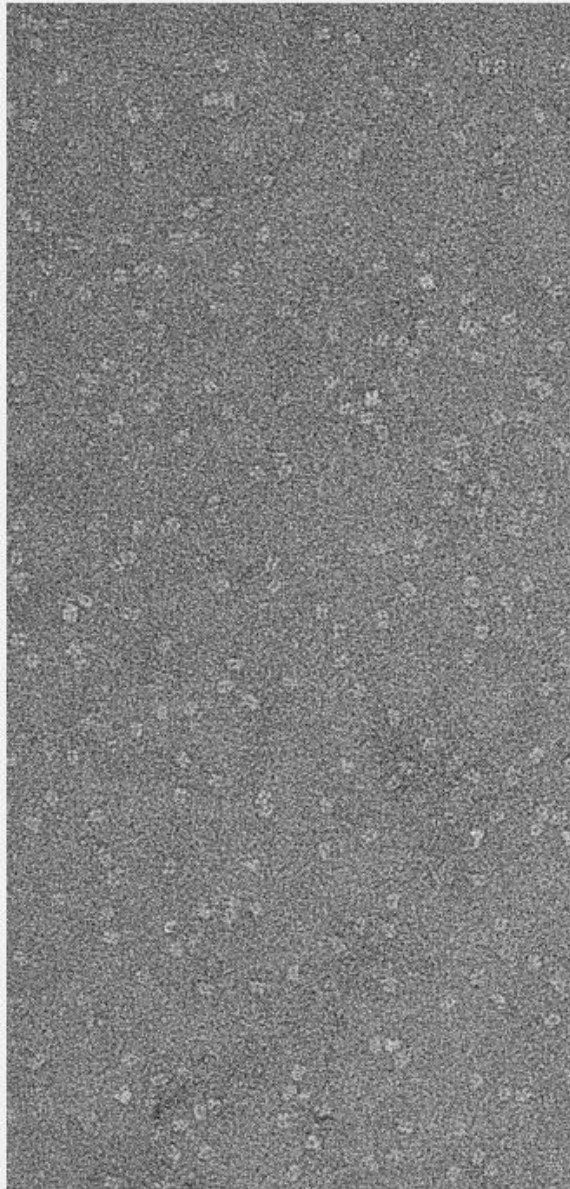
■ Contrast Transfer Function (CTF) Issue

Normalized Cryo-Image



■ Contrast Transfer Function (CTF) Issue

Normalized



Normalized Cryo-Image



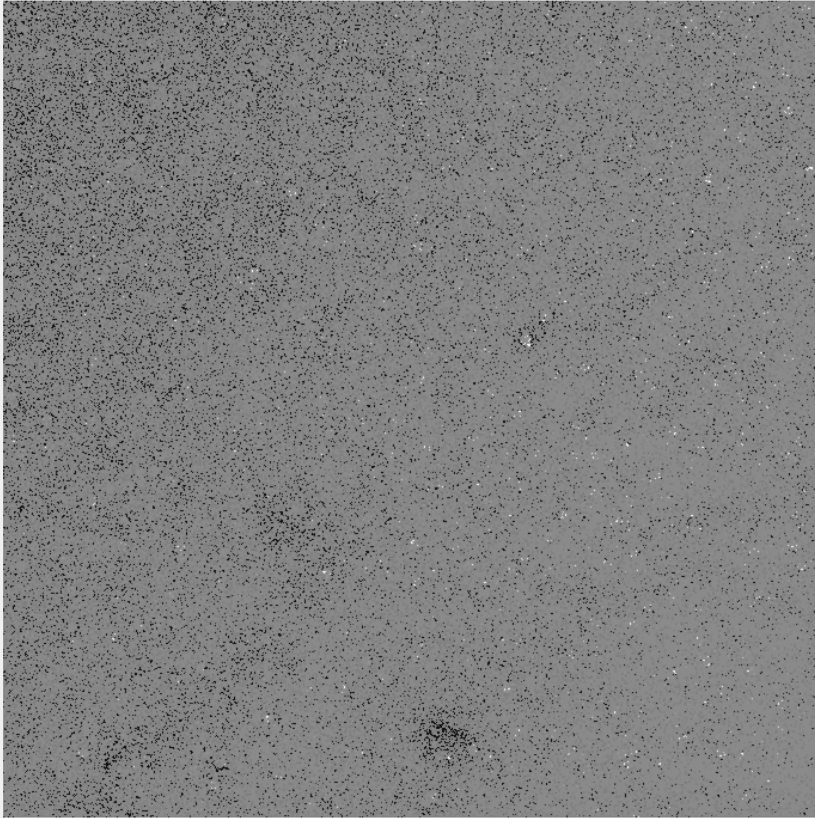
Before Contrast Adjustment

After Contrast Adjustment

■ Contrast Transfer Function (CTF) Issue

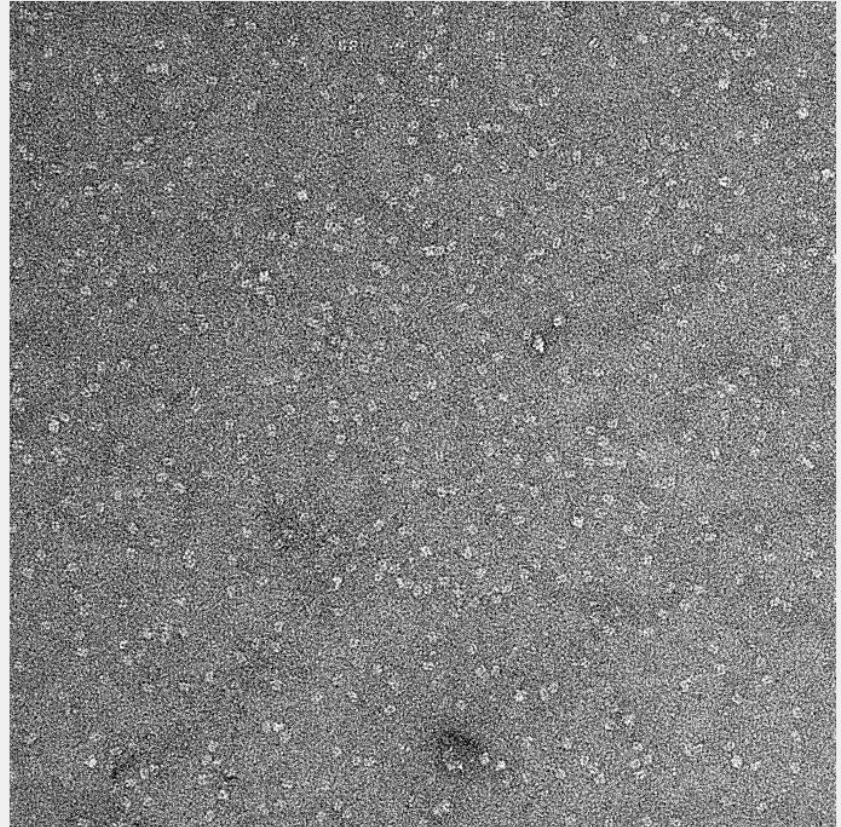
Before Contrast Enhancement Approach

Restored Cryo-Image



After Contrast Enhancement Approach

Normalized Cryo-Image



▪ Next Steps

- Convert the whole Cryo-images dataset from the '***.MRC**' format to '***.TIFF**'.
- Create a new **Pre-processed Cryo-images** dataset, after solving the CTF problem.
- Design Such a **Clustering Approach** that has a descent ability to cluster and detect the particles in the Cryo-images.
- Evaluate **our particles detection and selection approach** by seeing how many particles that can be detected by our automatic approach Vs. the manually labeling version.
- Create a **training dataset** by automatically select the best particles through our clustering approach.
- Train and Test the Deep Learning Approach (**Fast-RCNN**) to detect the whole Partials in the Cryo-images.
- Evaluate the **Time** and **Accuracy** through the whole approach.