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**CS516 - Computer Vision**

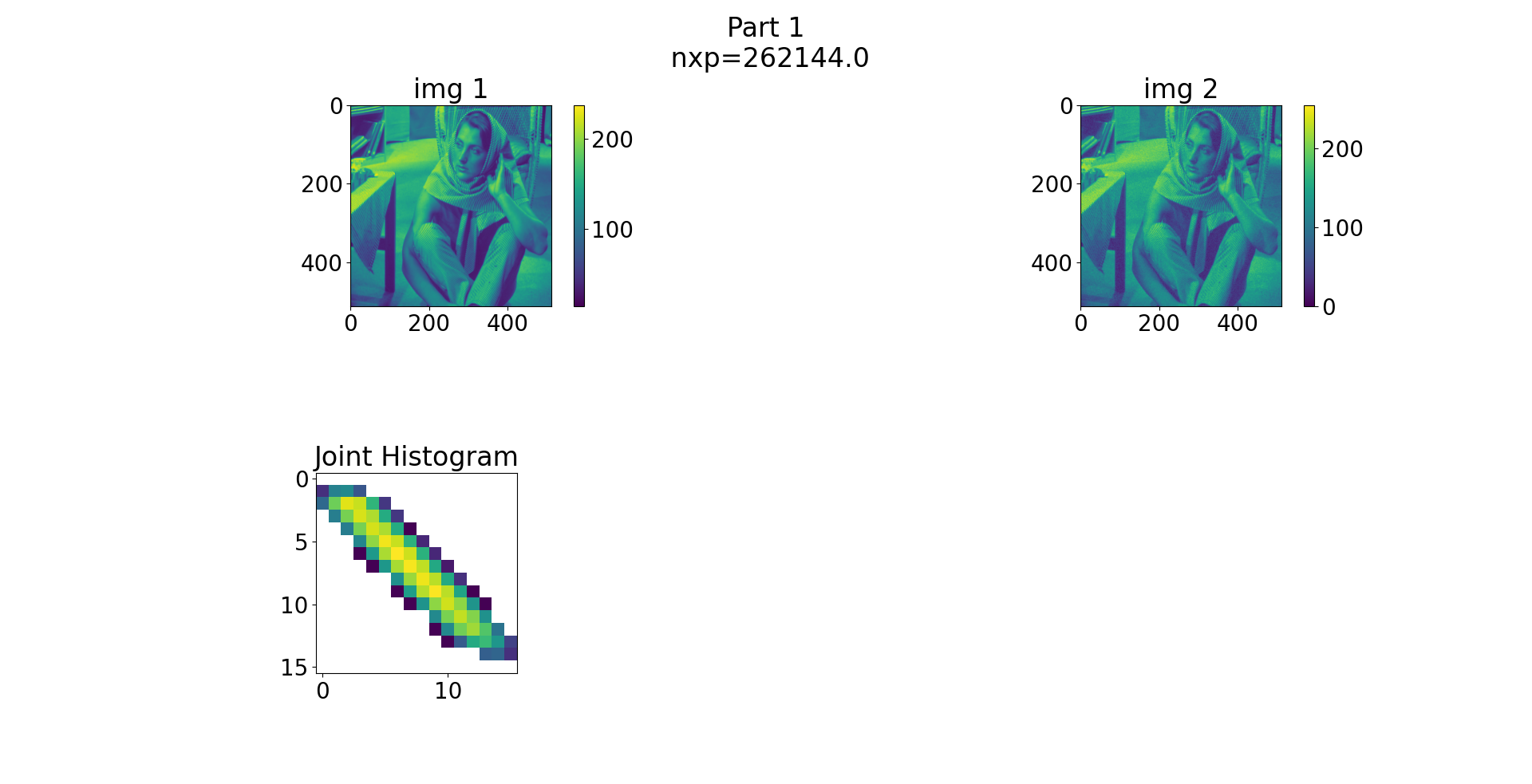
**Prof. Russell Butler**

Students

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**Part 1: Joint histogram 10/100**

* Completed all.
* We have not shown all the images output in this pdf but it’s written in code.



**Part 1(C) Observation:**

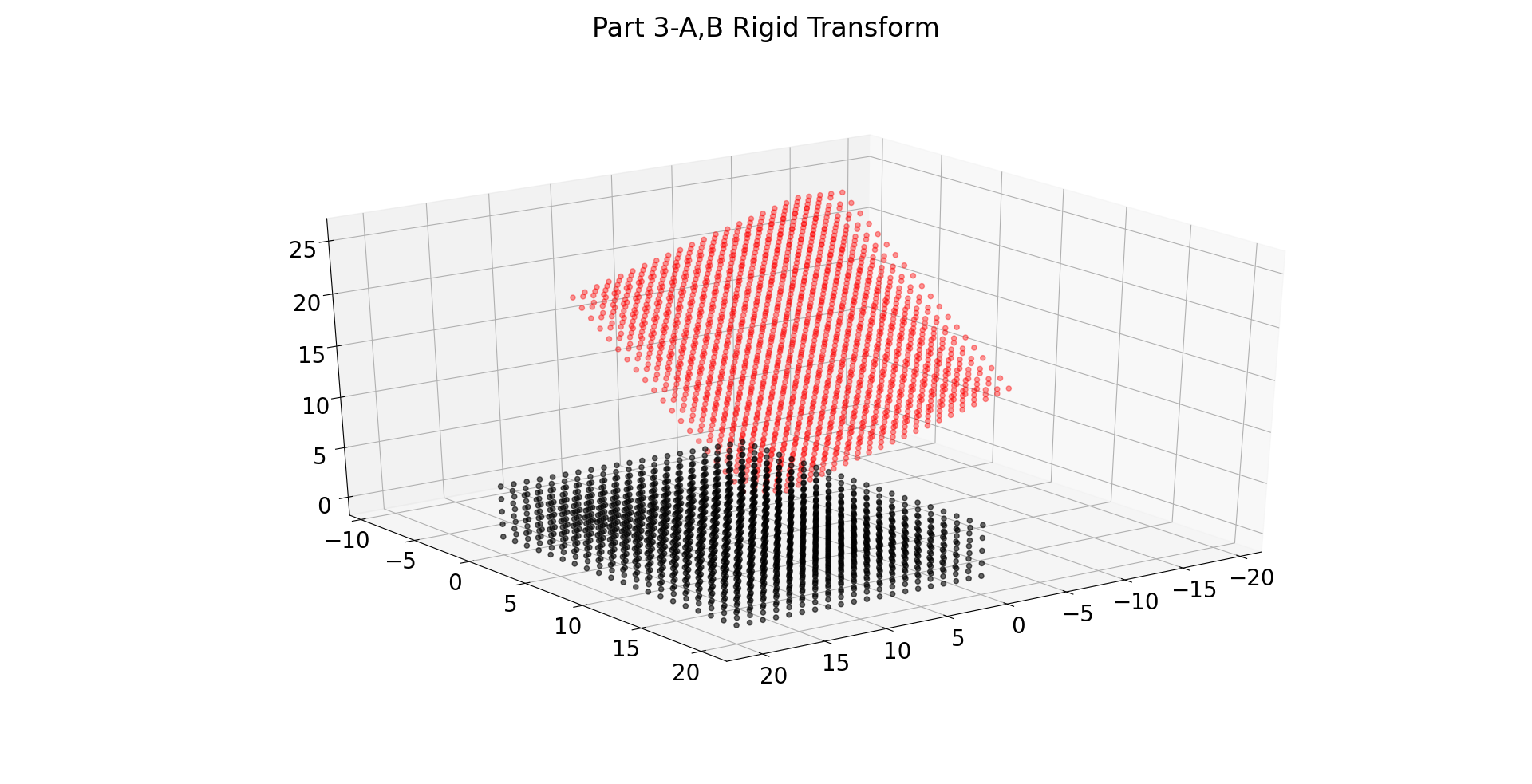
* I1 and J1 are the same due to which joint histogram is diagonal.
* I2 and J2 are also similar but the intensity of grayscale is different due to which joint histogram is a little bit scattered around both axes (x and y). Not sure about two small dots I think it’s the background.
* The I3 and J3 are very different which causing more scattered joint histograms. Similarly, with pair I4 and J4 we can see scattered points.

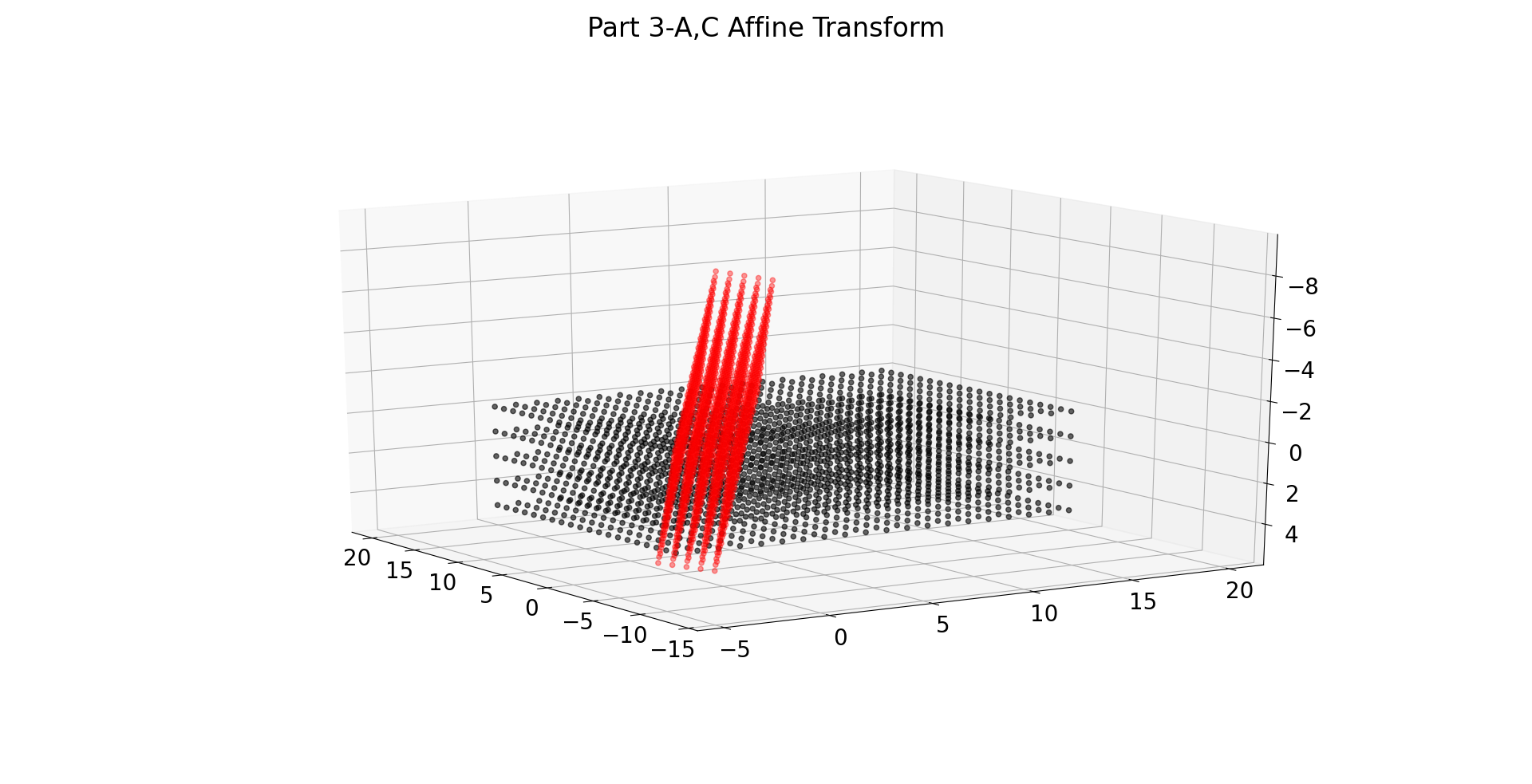
**Part 2 (similarity criteria 20/100):**

* completed all parts.
* No output to show in this question.
* MI depends on image similarity. In the first pair, we can see a very high value of MI, whereas in the next image pairs the value goes decreasing as they are getting different.
* The Pearson correlation coefficient fails to detect any non-linear relationship, so it does not give us very useful information.
* The SSD variant as it depends on the similarity of the images. The First 2 pairs I1 and J1 are similar hence SSD is higher whereas the next pairs are different hence the SSD is low.

**Part 3 (spatial transforms 20/100):**

* Completed all parts.



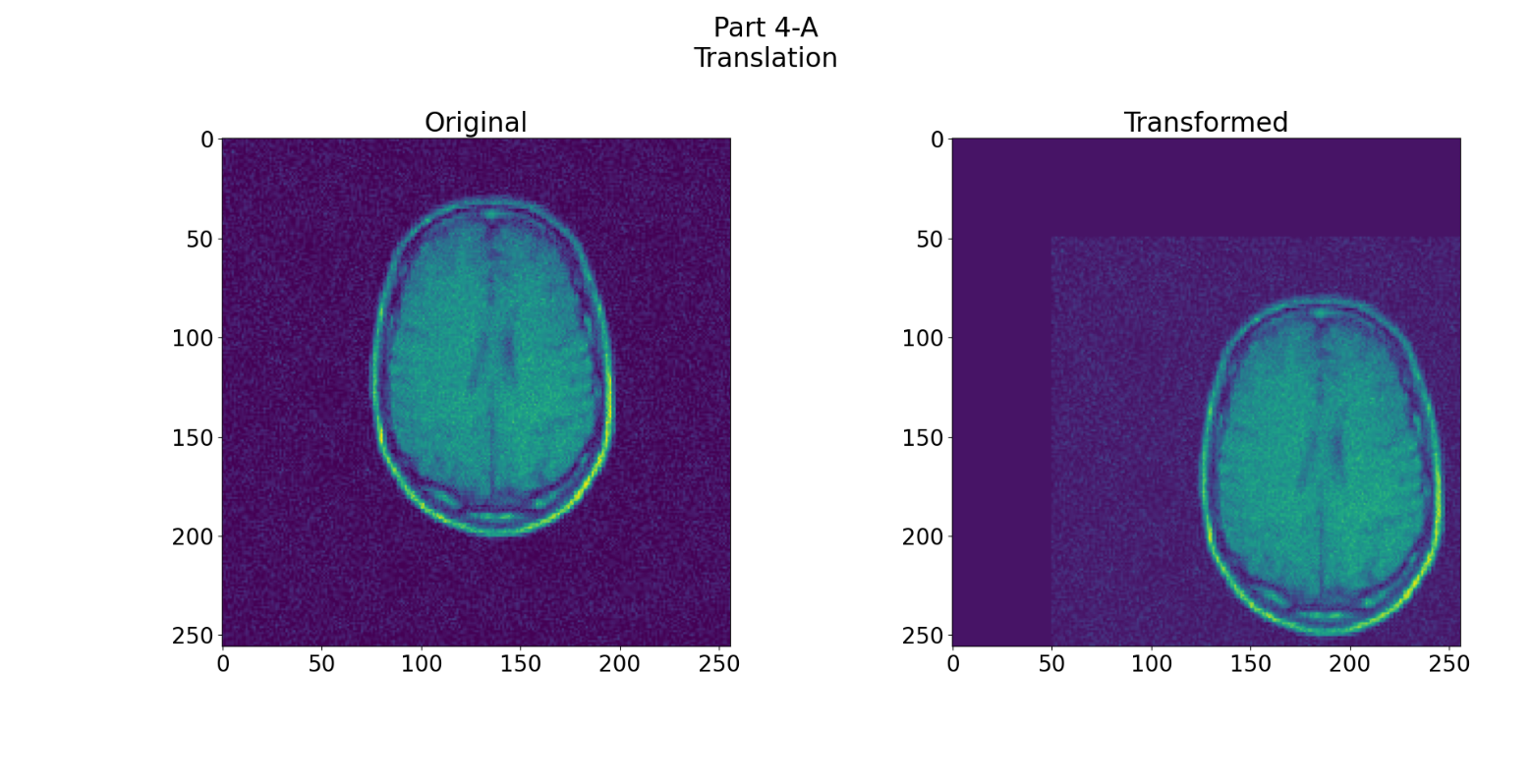


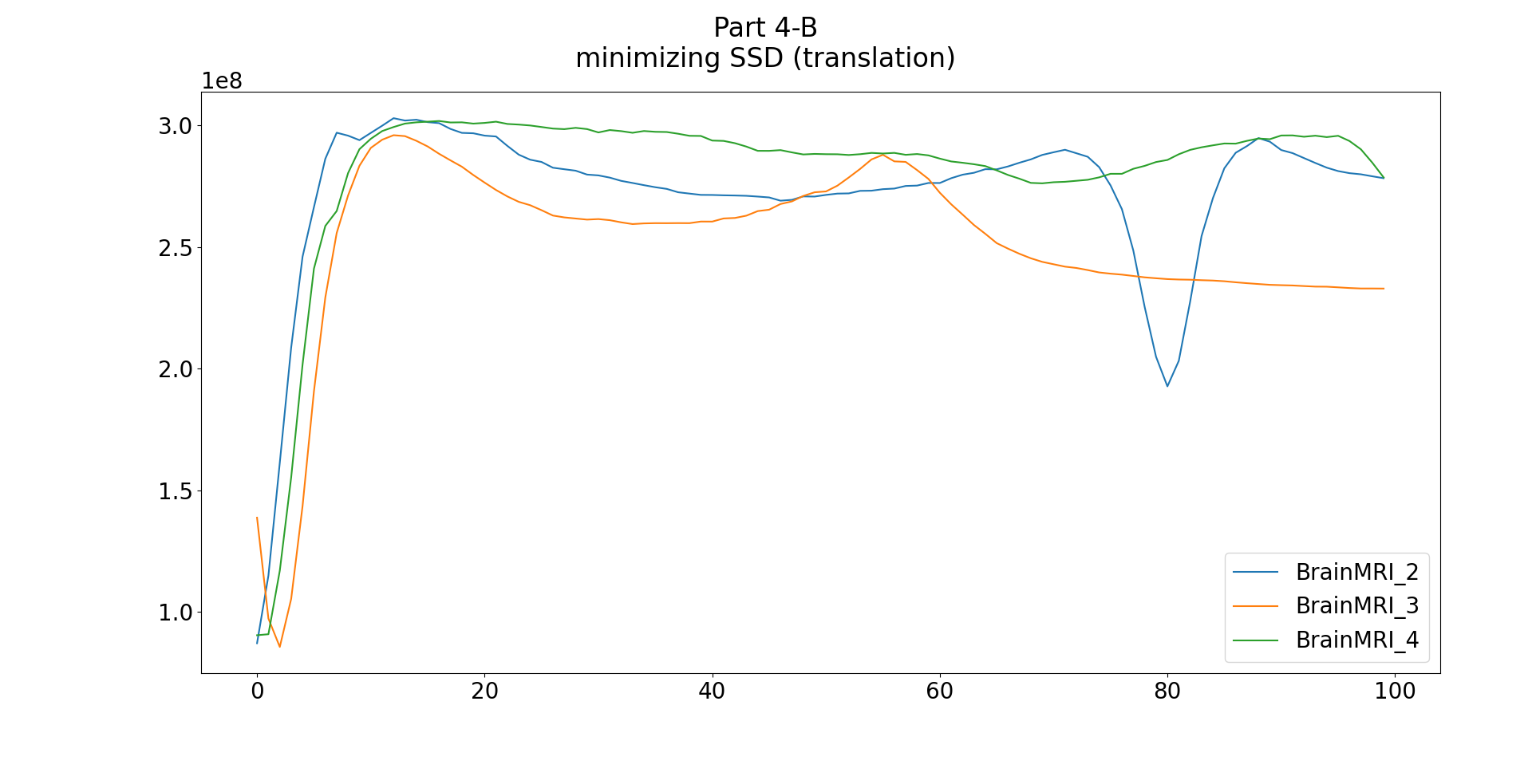
**Part 3(D):**

* M1- In code, we can see the 4x4 Translation matrix and notice in translation only 4th column changes. In M1 first 3 values of the 4th column are changed so definitely translation is applied on M1. Maybe some rotation is also applied to M1(because of diagonal values).
* M2- Translation on X and Y because the 4th column’s first 2 values changed. Rotation also because for the same reason as mention in M1.
* M3 – Translation and rotation the same reason as in M1.

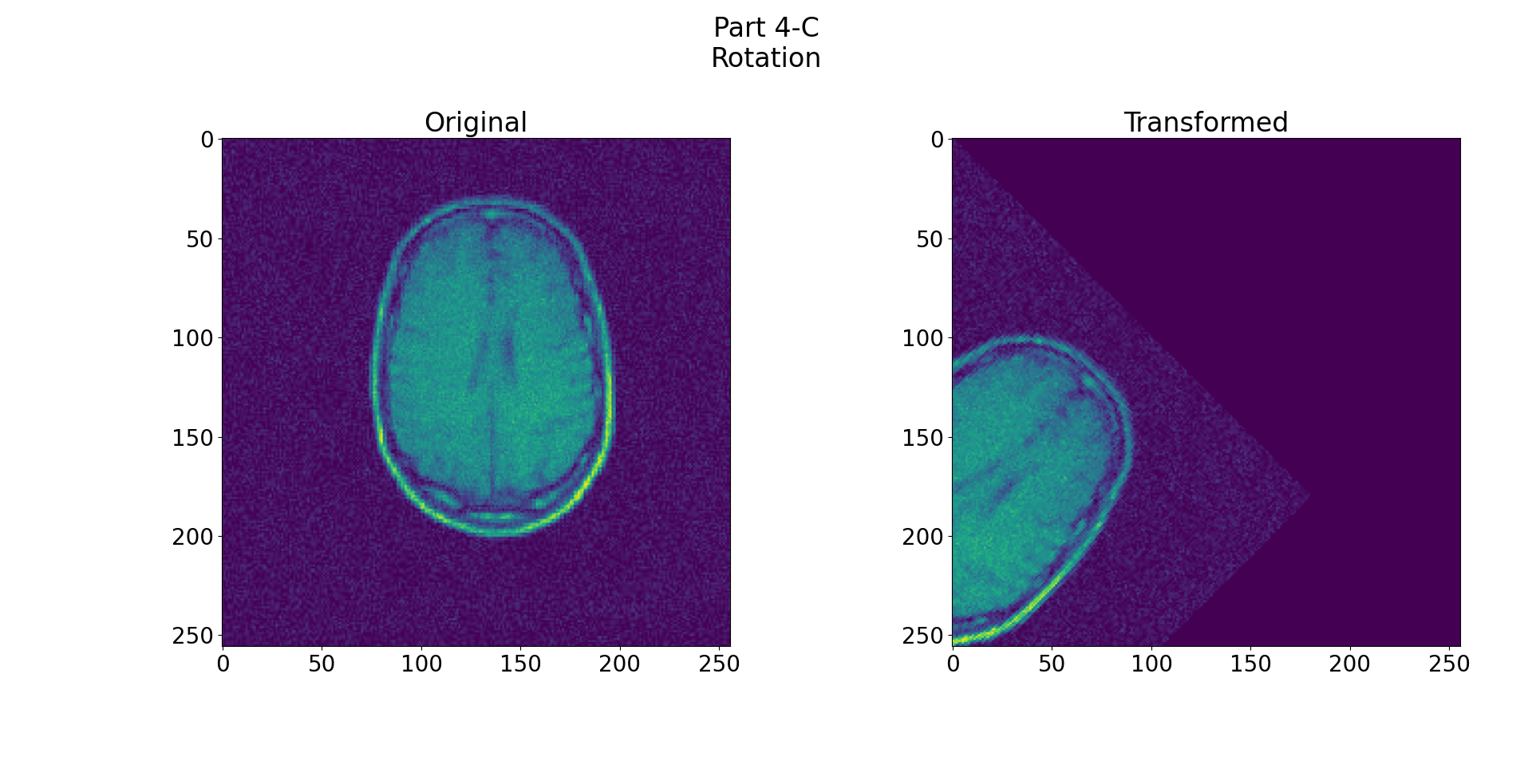
**Part 4: simple 2d registration 40/100:**

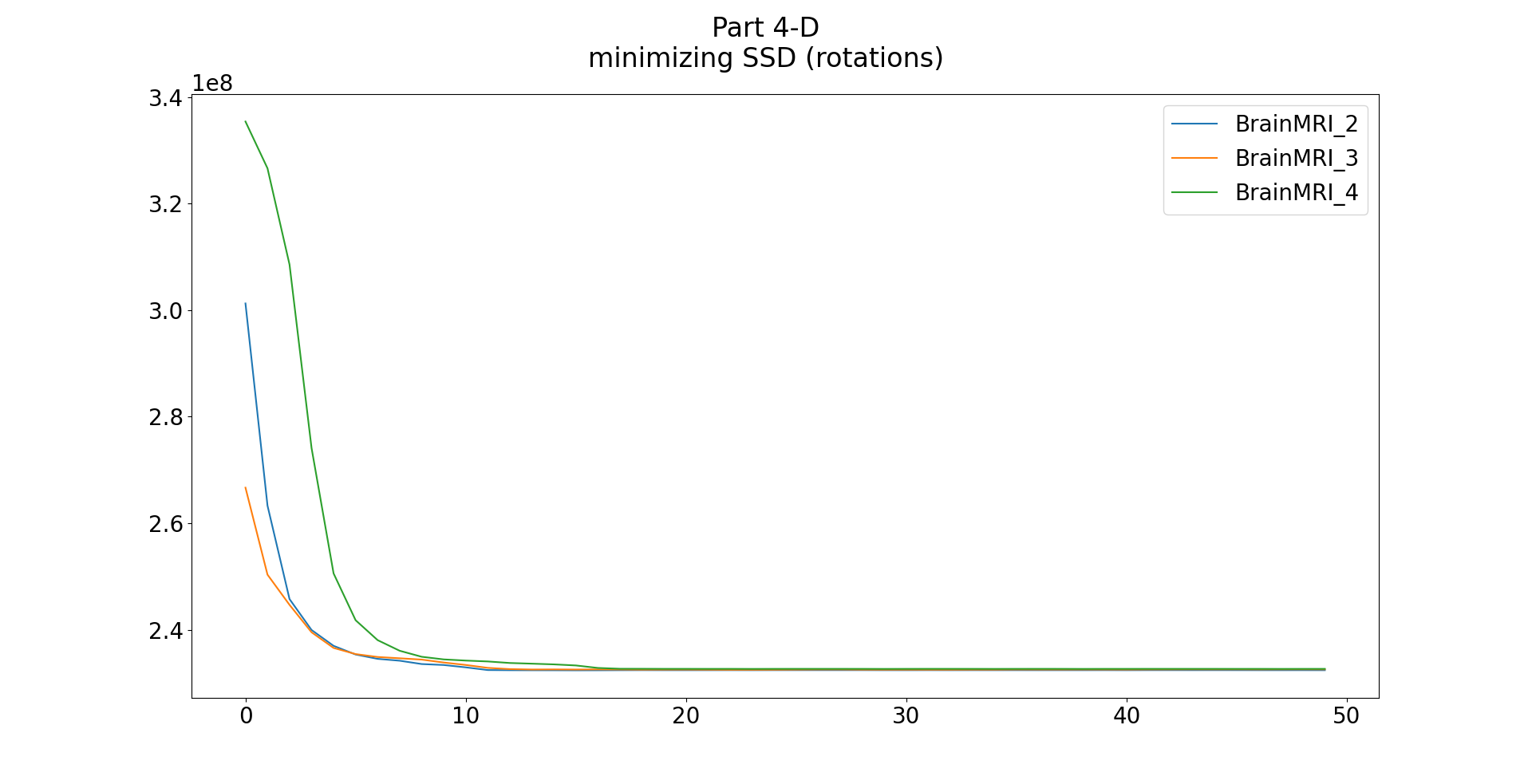
* Expect 4-E all other parts completed.





* Image “BrainMRI\_2.jpg” SSD curve is decreasing because it perfectly adjusts with “BrainMRI\_1.jpg” in addition to that after each iteration translated image causes SSD to minimize, whereas in "BrainMRI\_3.jpg" and "BrainMRI\_4.jpg” not.





**Part 5: practical application: 20/100 (10%, +10% bonus):**

* All parts completed
* We achieved it in the following way
* Firstly, we align “t1.nii” and “tof.nii” by executing the command “flirt -in tof.nii -ref t1.nii -out tof\_in\_t1.nii”.
* The output file “tof\_t1.nii” then displayed in matplotlib by overlaying on “t1.nii”.

