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Singular Value Decomposition: Altering an Image

In this project, we have downloaded a picture of WIT and transformed it into a blurred new picture. For this to happen, we used the Singular Value Decomposition (SVD) technique that alters the original image by reducing the quality of the image, in plain English. In math, we look for the smallest diagonal values of S and changed/altered them by a value of 0. The reason for this was to decrease the rank of the original image (stored the new image in a new variable, in this case is called D) to a given rank.

Bellow, we will find four images: the original image, the imaged ranked 10, 20, and 30. The first image has not been decomposed. The others have. Also, we applied a grey filter all images but the original. Furthermore, the second image is been decomposed by rank 20. The third by 30th rank, and the fourth by 40th rank. Let us look at the alterations.

Rank: The dimensions of the vector space of a matrix.

Full Rank: Largest possible value of the same dimension of a matrix.

<u>First Image:</u>

This is the original image.

Rank 543

Full Rank

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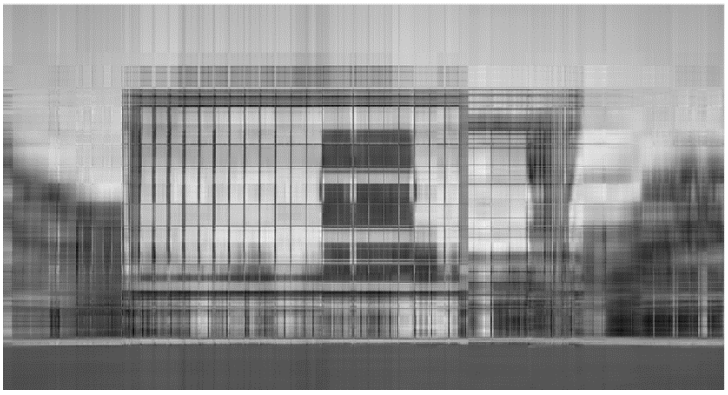
Second Image:



This is the image after SVD:

Rank 10

Third Image:

This is the image after SVD:

Rank 20

Fourth Image:

This is the image after SVD:

Rank 30

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We can notice that the image with rank 10 is the one with the most blurred effect. The reason for this is that the values taken are not as small as the remaining values. In the second picture, we are changing the values from the 11^{th} position to 543^{rd}.