RESTORMER: Efficient Transformer for High-Resolution Image Restoration

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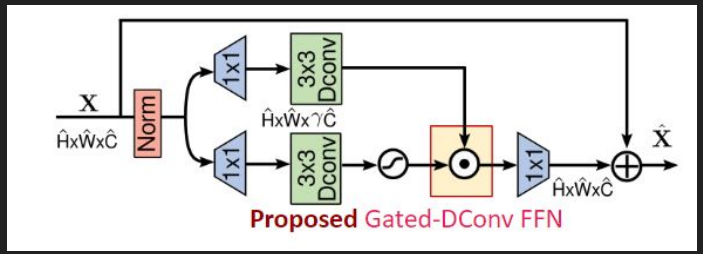
2 PROPOSED MODIFICATION IN THE TRANSFORMER MODEL TO CAPTURE LONG RANGE PIXEL DEPENDENCIES AND LOCAL DEPENDENCIES

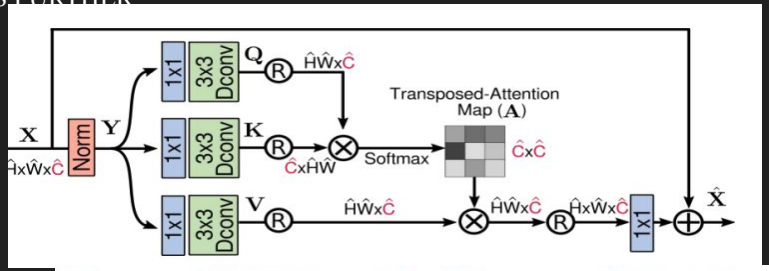
1}IN THIS PAPER WE PROPOSED MULTI-DECONV HEAD TRANSPOSE ATTENTION IN WHICH WE APPLY SELF ATTENTION ACROSS CHANNELS RATHER THAN THE SPATIAL DIMENSION THAT IS TO COMPUTE CROSS COVARIANCE ACROSS CHANNELS TO GENERATE AN ATTENTION MAP ENCODING THE LONG RANGE PIXEL DEPENDENCIES.

2}WE INTRODUCE DEPTH WISE CONVOLUTIONS TO EMPHASIZE ON THE LOCAL CONTEXTS BEFORE COMPUTING NON LOCAL OR GLOBAL INTERACTIONS TO GAIN INFORMATION FROM SPECIAL NEIGBOURING PIXEL POSITIONS,IT IS USEFUL FOR LEARNING LOCAL IMAGE STRUCTURE FOR EFFECTIVE IMAGE RESTORATION

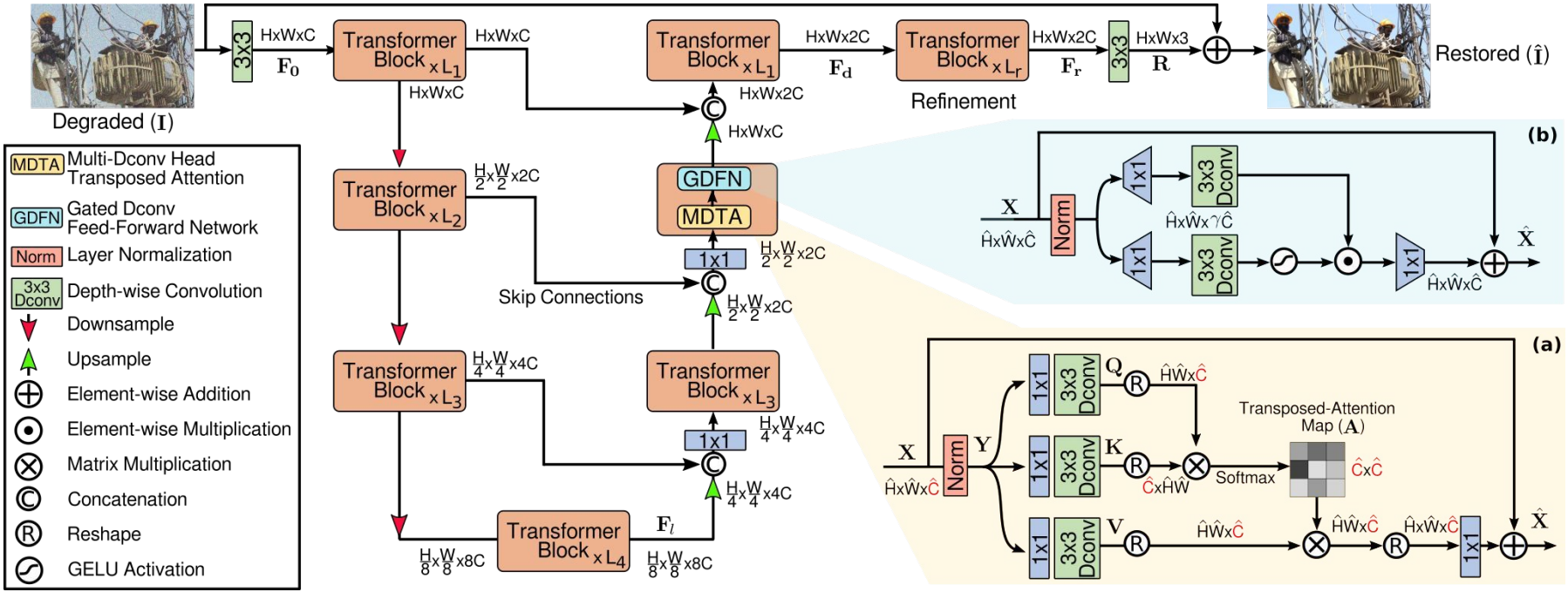
- WE INTRODUCE A GATING MECHANISM.
- The gating mechanism is formulated as the element-wise product of two parallel paths of linear transformation layers, one of which is activated with the GELU non-linearity
- THIS GATING MECHANISM PERFORMS CONTROLLED FEATURE TRANSFORMATION THAT IS PRESSING LESS INFORMATIVE FEATURES AND ALLOWING ONLY USEFUL INFORMATION TO PASS FURTHER



Proposed Gated-DConv FFN

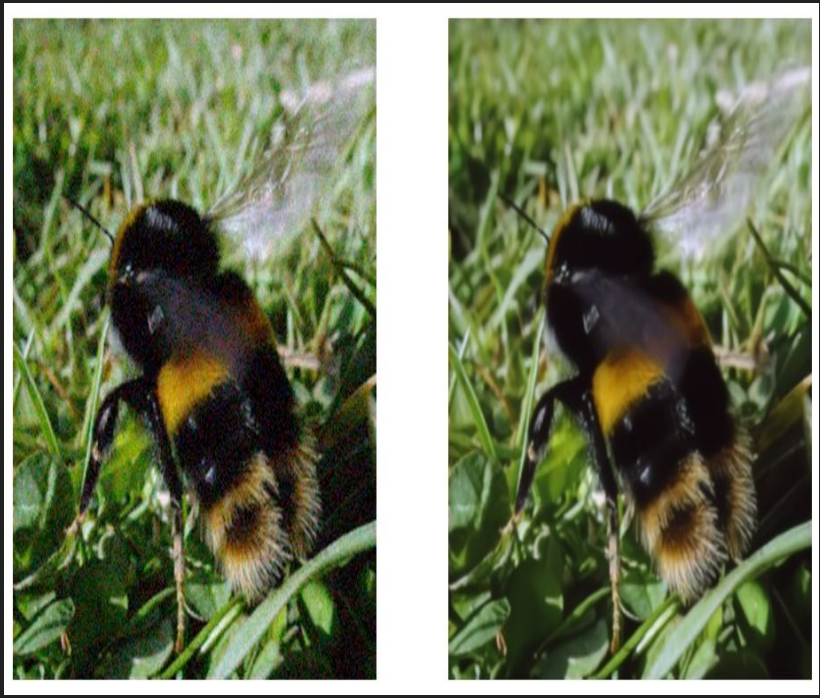


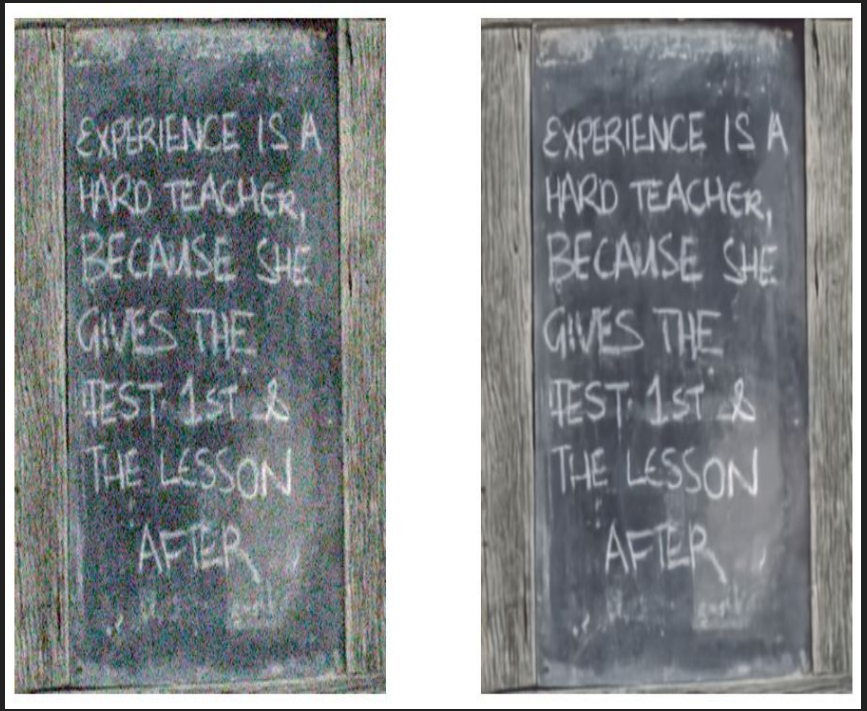
Proposed Restormer



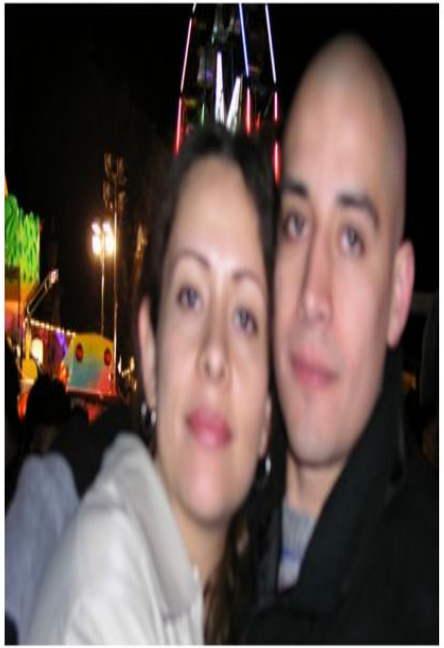
TASK-1-:REAL DENOISING OF IMAGES

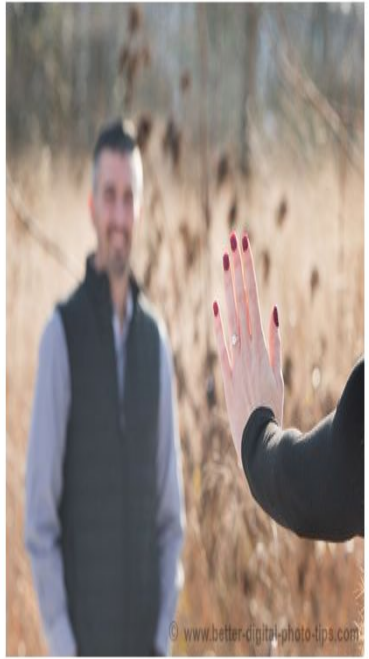
MORE RESULTS OF REAL DENOISING OF IMAGES

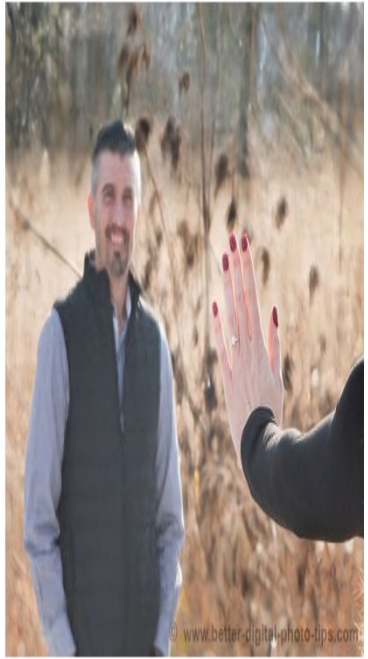




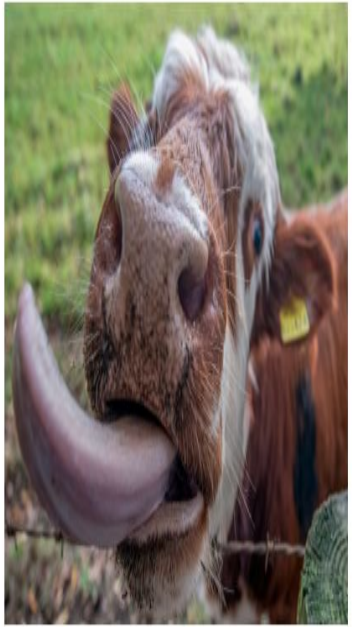
TASK2:-SINGLE IMAGE DEFOCUS_DEBLURRING

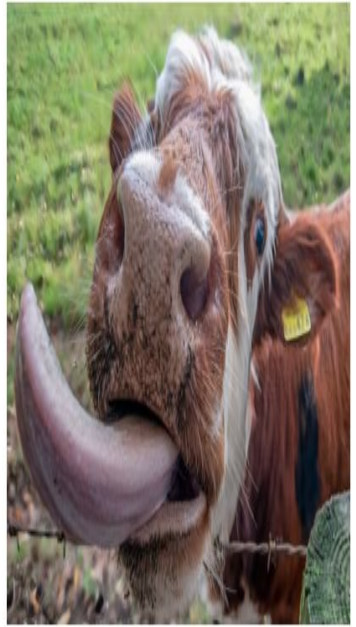




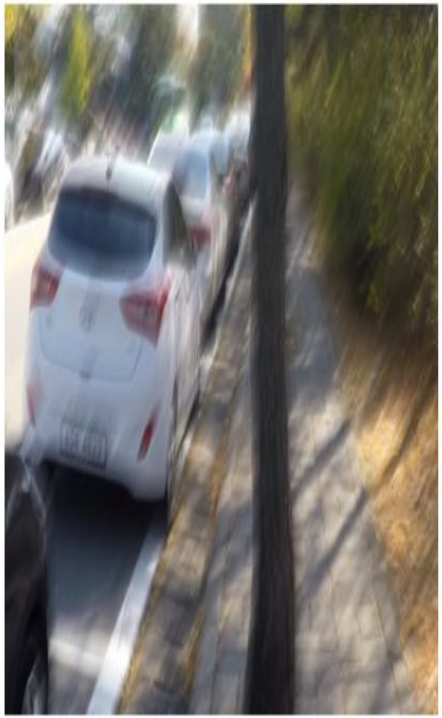


SOME MORE RESULTS





TASK 3-:MOTION DEBLURRING



SOME MORE RESULTS

TASK 4-:DERAINING

SOME MORE RESULTS

PSNR AND SSIM VALUES OF OUR MODEL

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Average PSNR: 46.34281721377951
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Average SSIM: 0.9954062008857727
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NEW APPLICATION -:IMAGE SUPER RESOLUTION

IN THIS RESTORMER PAPER THEY HAVE PERFORMED 4 TASKS ON THE IMAGES -:1}REAL DENOISING OF THE IMAGES

2}SINGLE IMAGE DEFOCUS AND DEBLURRING

3}MOTION DEBLURRING

4}DERAINING

WE CAN OBSERVE THAT IN ALL THESE TASKS THE AUTHOR HAVE USED THE SAME SIZE IMAGES AND HAVE NOT TALKED ABOUT INCREASING THE SIZE OF A SMALL DIMENSIONAL IMAGE BY UPSCALING IT TO LARGE DIMENSIONAL AND THEN INCREASING THE QUALITY OF THE IMAGE,IN OTHER WORDS -: IMAGE SUPER RESOLUTION

METHOD FOR THE NEW APPLICATION

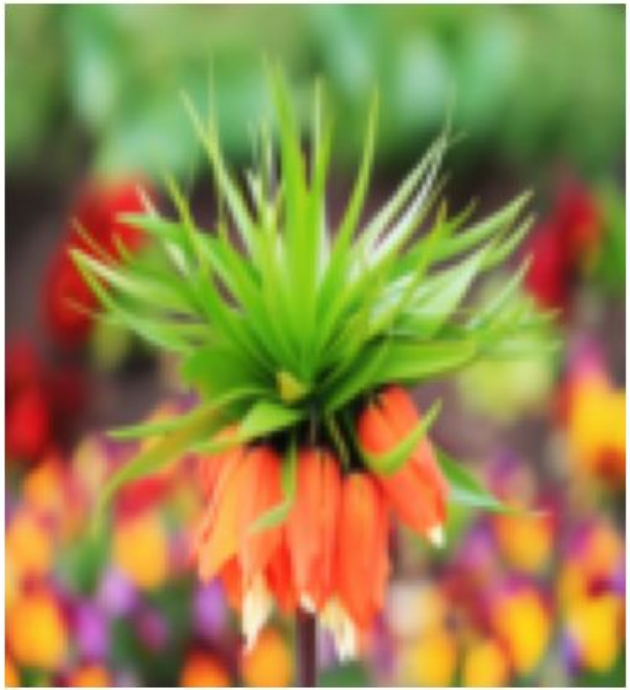
THE NEW APPLICATION THAT WE APPLIED IN THE SAME MODEL IS IMAGE SUPER RESOLUTION.

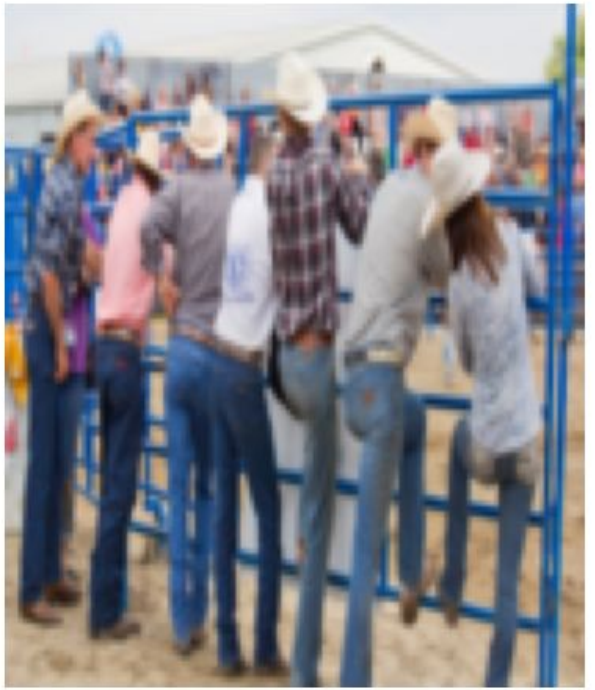
METHOD-:

WE HAVE TAKEN A CUSTOM DATASET AND DOWNSCALED THE IMAGES TO 28*28

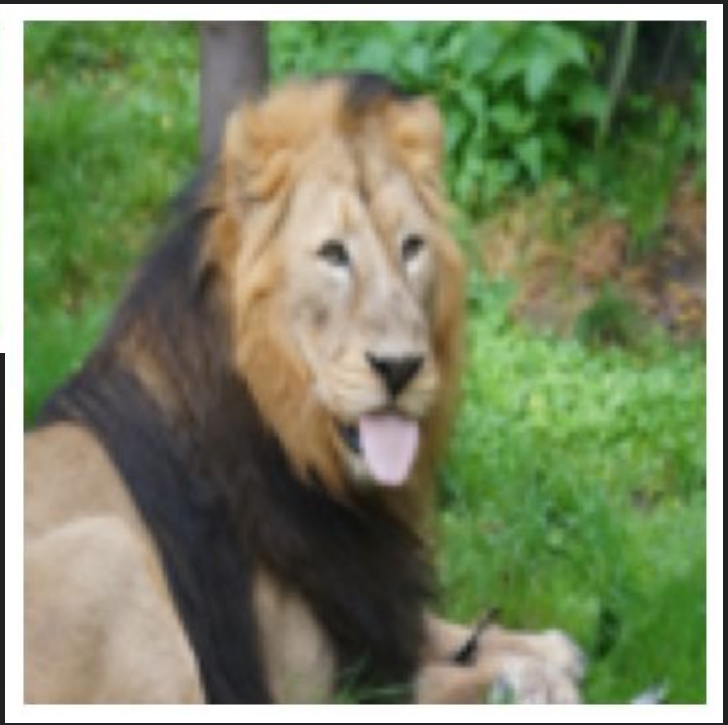
WE HAVE FEED THOSE DOWNSCALED IMAGES INSIDE OUR RESTORMER MODEL WHICH UPSCALED THOSE IMAGES TO 128*128 AND THEN PERFORMED SINGLE IMAGE DEFOCUS AND DEBLURRING AND GAVE US AN UPSCALED SUPER RESOLUTION IMAGE.

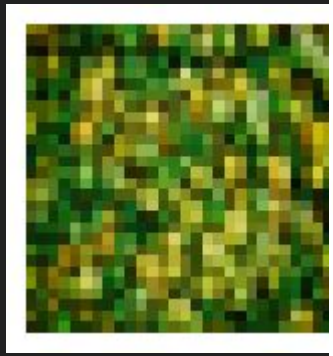
RESULTS OF IMAGE SUPER RESOLUTION



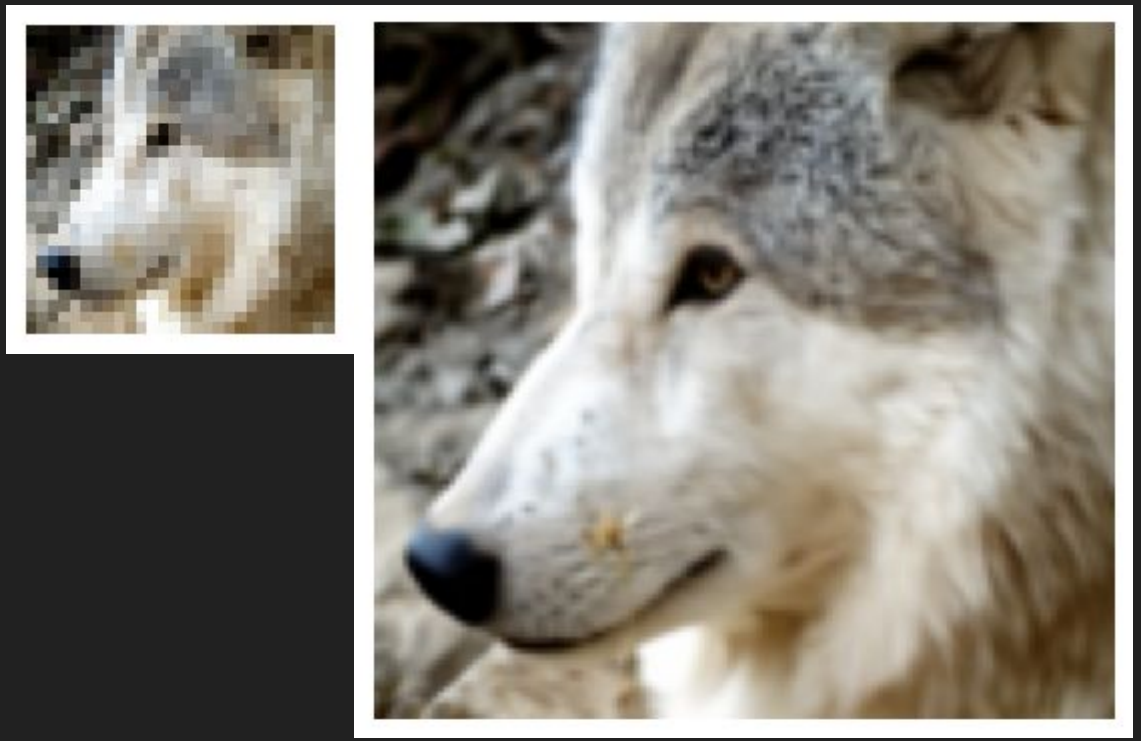


MORE RESULTS OF IMAGE SUPER RESOLUTION





SOME MORE RESULTS



PSNR RESULTS ON THE NEW APPLICATION

Average PSNR: 29.826964914558626

WE CLEARLY OBSERVED A REDUCED PSNR VALUE ON THIS NEW APPLICATION BY THE MODEL

CHAT GPT QUESTION

The RestoRanger model, introduced in the RestoRmer paper, is primarily designed for high-resolution image restoration tasks such as super-resolution, denoising, and image deblurring. However, the authors of the paper also demonstrate its ability to perform image inpainting, which involves filling in missing or corrupted parts of an image.

In image inpainting, the model is trained to predict the missing pixels based on the surrounding pixels and context information. The RestoRanger model can generate high-quality and visually plausible results for image inpainting, as demonstrated in the paper's experimental results.

The ability to perform image inpainting is a valuable application of the RestoRanger model, as it can be used to restore old and damaged photographs or to remove unwanted objects from images. In addition, the RestoRanger model's efficiency and effectiveness make it suitable for real-world applications where image restoration needs to be performed quickly and accurately.

CHAT GPT FAILS TO GIVE ANY NEW APPLICATION OF THE MODEL AS IT DOES NOT HAVE ANY DATA ABOUT THIS RESTORMER MODEL AND IT TALKS ABOUT SOME OTHER MODEL CALLED RESTORANGER MODEL WHICH RESTORES OLD IMAGES.

CITATION

THE CODE IN THIS PAPER IS TAKEN FROM THE ORIGINAL GITHUB REPOSITORY OF THE PAPER.

THE NEW TASK CODE HAS BEEN DONE BY MYSELF.