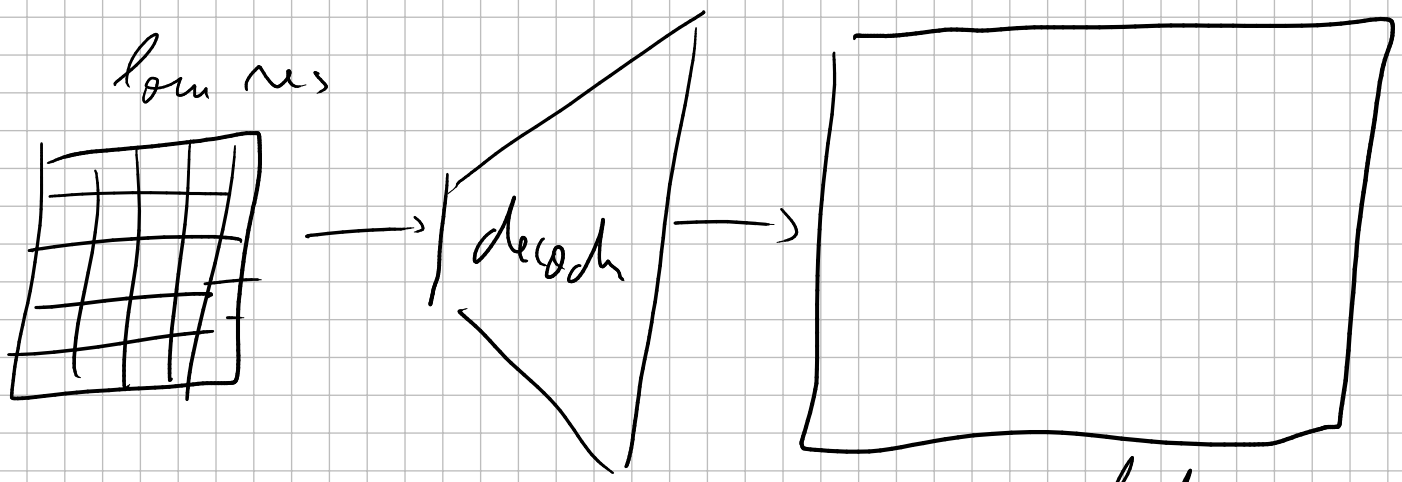
① The checker board pattern is present in all images whose the outcome of upsampling / transpose_conv (deconvolution in short) ??



generated

ing

⇓

contains checkerboard pattern.

Unet is a famous example of this process

→ This phenomena is a direct consequence of the choice of (kernelsize, stride) in the deconvolution

→ when kSize / sTride != 0

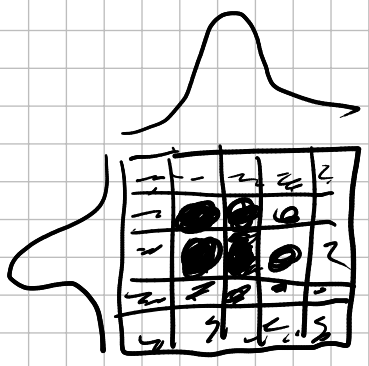
⇒ uneven overlap

⇒ alternating regions in the image of where the kernel was applied frequently & not frequently

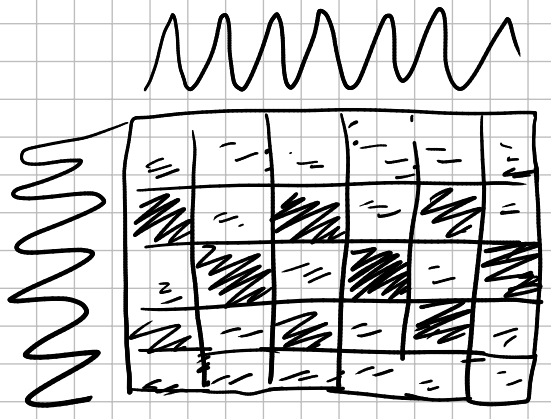
→ when kSize / sTride == 0

⇒ even overlap

⇒ smooth



smooth



checkerboard

→ This phenomena is amplified with network depth & different kernelsizes & strides & weights

(!) stride 1 convs that are present to replace last classifier head in Networks, are good at dampening the effect of artifacts (checkerboard effect) (since they are like a averaging effect)

⇒ convs that do not upsample (do not change size of image) do not produce artifacts / remove artifacts of high frequency (averaging effect of conv ; seeing conv as runing avg)

since high frequency artifacts mean artifacted pixels are close to each other ⇒ conv will smooth them out

(!) even with classification heads of 1 stride convs, low freq artifacts can still leak through

⇒ this is not a solution (!!!)

→ it is also easy to notice that checkerboard artifact is even more obvious with images that contain a good amount of bright colors /

There's a good reason why

let's take a base exaple,

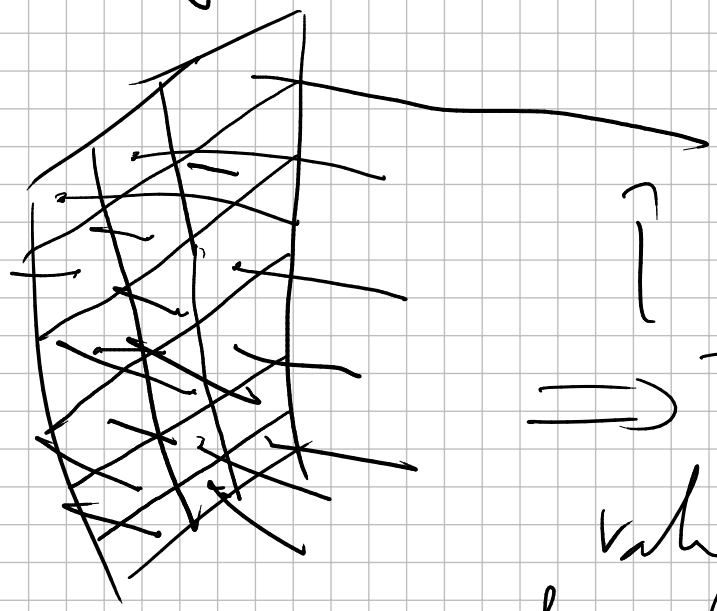
random kernel, random image, average bias

(bias is one of the things we can confidently hypothesis it is taking the average value since a fairly simple operation)

$\Rightarrow$ colors that are bright $\Rightarrow$ high value pixel

$\Rightarrow$ Their checkerboard artifacts will not be eliminated by the bias

(supposing relu is the activation function)



$\Rightarrow$ this pixel value (if is part of a checkerboard effect) will not be odd

actually the one's around it will be odd $\Rightarrow$ enhancing the checkerboard artifact)