Assignment 2
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Question 1

2D fourier transform is done by taking linear Fourier transforms row wise and column wise. The outputs are plotted on a logarithmic scale to get a complete idea in the code itself,

Question 2

Here we are already given that there are just two frequencies in the signal. Hence we take the fft of the given input signal. We find two frequencies which have max values and their conjugates. We take dot product with rect in given range around it. Now we take the inverse fft and we have the signal.

Here we observe on increasing window size, resolution in freq increases, while on increasing stride, resolution in time increases.

Question 3

Here I have take the given signal and move according to the window size and stride length. We give color according to gaussian distribution, and the output when shown as a image matches the spectrogram.

Question 4

From image1 we can say that translation make no difference to fft.
From image 2 we can say that on blurring the image the fft just becomes a bit smaller.

I have denoised the Img3 by keeping black stripes in the logarithmic convolution of given image and take ifft. The logic of doing so is the logarithmic fft will give me white stripes at the high frequency area, that is where noise exists. Hence it this approach is followed here. In output we can see how it has smoothened the input image and cleared the noise to an extent.

Question 5

I found the fft of all the digits. It is observed that each digit lies in range of sampling frequency so I have taken window size to be the sampling frequency, stride length to be 0. Now just taking the maximum value of dot product with fft of each digit.

Question 6

I have just applied brute force in rearranging the parts of ffts and sounding them. The one which seems meaningful is the answer.