Homework 6 MATLAB

Signal & System (003)

Se Young Chun

HW6: Undersampling in the frequency domain

- The topic of this assignment is "Undersampling in the Frequency Domain."
- In various domains, such as medical imaging, when acquiring images, we often obtain them in the frequency domain. Undersampling in the frequency domain allows us to save time and costs by acquiring fewer samples compared to fully sampling the frequency domain.
- **However, the crucial question is: How should we undersample?**
- Through this assignment, we aim to explore and understand the various techniques and strategies employed for undersampling in the frequency domain. You will have the opportunity to delve into the research literature, study different approaches, and analyze their advantages and limitations. Furthermore, you are encouraged to investigate the impact of undersampling on image quality, reconstruction algorithms, and potential artifacts that may arise.

HW6: Undersampling in the frequency domain

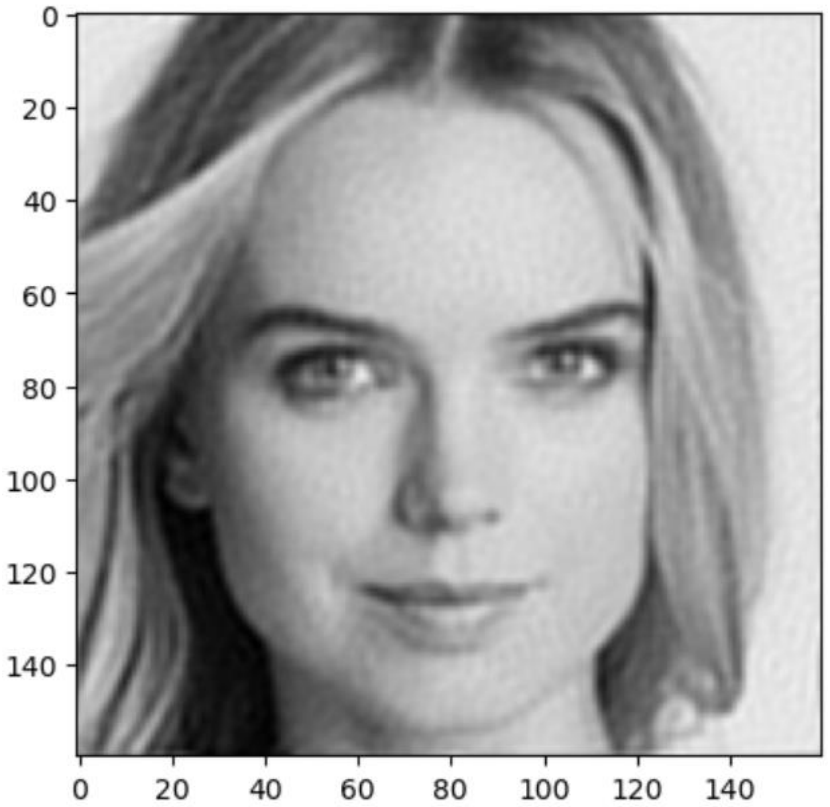
- The objective of this assignment is to undersample 160x160 human face images in the frequency domain by a factor of 4 while maximizing the peak signal-to-noise ratio (PSNR). For training purposes, you will be provided with a set of 10 images, and for validation, one image will be given. Please note that test images will not be made available.
- Using the provided training and validation images, your task is to submit a 160x160 undersampling mask. **The mask should be a binary 2D matrix of size 160x160, with exactly one-fourth (1/4) of the entries being 1, and the remaining three-fourths (3/4) being 0.**
- The mask requirements above is to ensure all of you sample same amount of frequency information.

HW6: Undersampling in the frequency domain

- To optimize the mask,
  - Try sample and reconstruct images in train dataset with various types of mask multiple times
  - TA will use the test images that demonstrate similar patterns to the training images.
  - The higher the PSNR value, the higher the score for your assignment
  - Reconstruction result when undersampled by random mask is given for an example in matlab file.

HW6: Undersampling in the frequency domain

- If performed well, you can achieve results like below
- tested on validation dataset, PSNR : 30.92



HW6: Undersampling in the frequency domain

☐ Compress **‘HW6.m’** file as zip file and upload it in eTL. → Zip file name : **Student ID_NAME_HW6 (**ex: 2023-12345_gildonghong_HW6)

☐ Additionally, Submit **‘free-form Word Report pdf’** which explains about your writing Matlab codes (approximately 1~2 pages) in either Korean or English. The Report should include your experiment results(PSNR+Images) , optimized mask and the reason why you choose that mask.

☐ Please read all comments in given m files before posting a question in eTL.

☐ Feel free to email me if you have any questions about the matlab assignment : snu.icl.ta@gmail.com (TA Hae Chang Lee, 이해창 조교)