

## 1 Ground Truth Images

Figure 1 displays the ground truth images for each  $k$ .

The selected DCT columns and their coefficients of an image with a  $k$  value are carried forward in the image generation with higher  $k$  values.

To generate a different set of images, simply change the value of variable `seed`.

**Note:** While running `myMainScript`, please do not close the figure window that appears after data generation completion of OMP algorithm.

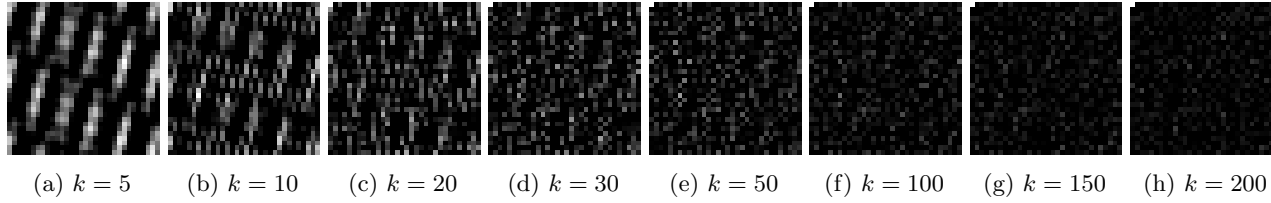


Figure 1: Original images

## 2 Reconstructed Images

### 2.1 Task 1

For  $k \in \{5, 10, 20, 30, 50, 100, 150, 200\}$  and  $m \in \{100, 200, \dots, 1000\}$ .

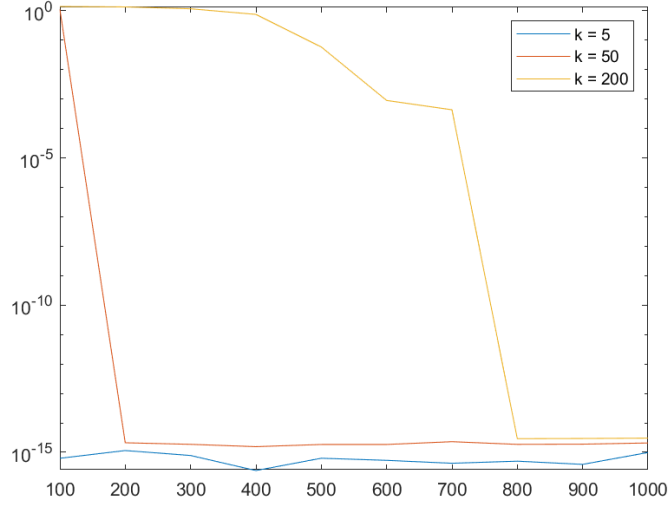
OMP and IHT algorithms are implemented in the `code` directory and the reconstructed images and the RMSE values are located in the `results` directory. RMSE values are stored as a 2-D matrix with row index corresponding to the respective  $k$  value index and column index corresponding to the respective  $m$  value index.

## 2.2 Task 2

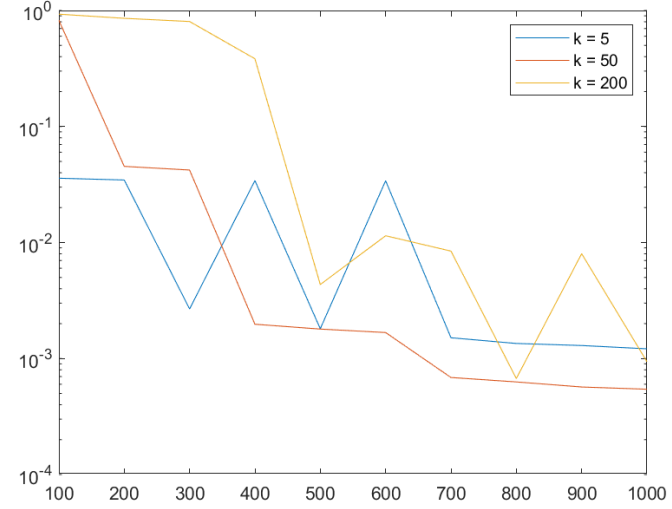
For  $k \in \{5, 50, 200\}$  and  $m \in \{100, 200, \dots, 1000\}$ .

RMSE plots are shown in 2 and reconstructed images are shown in 3 and 4.

As seen by the plots RMSE values are lesser than 1 for both algorithms implying a good reconstruction. For OMP, they tend to zero very quickly for  $k \in \{5, 50\}$  whereas the  $k = 200$  case needed 800 measurements for RMSE to become very small. For IHT, images are almost same to the actual images in all cases except for  $(k, m) \in \{(50, 100), (200, 100), (200, 200), (200, 300), (200, 400)\}$ . Implying that as  $k$  increases, more measurements are required for a perfect reconstruction.



(a) OMP



(b) IHT

Figure 2: Comparison of OMP and IHT plots for variation with  $m$  for a fixed  $k$

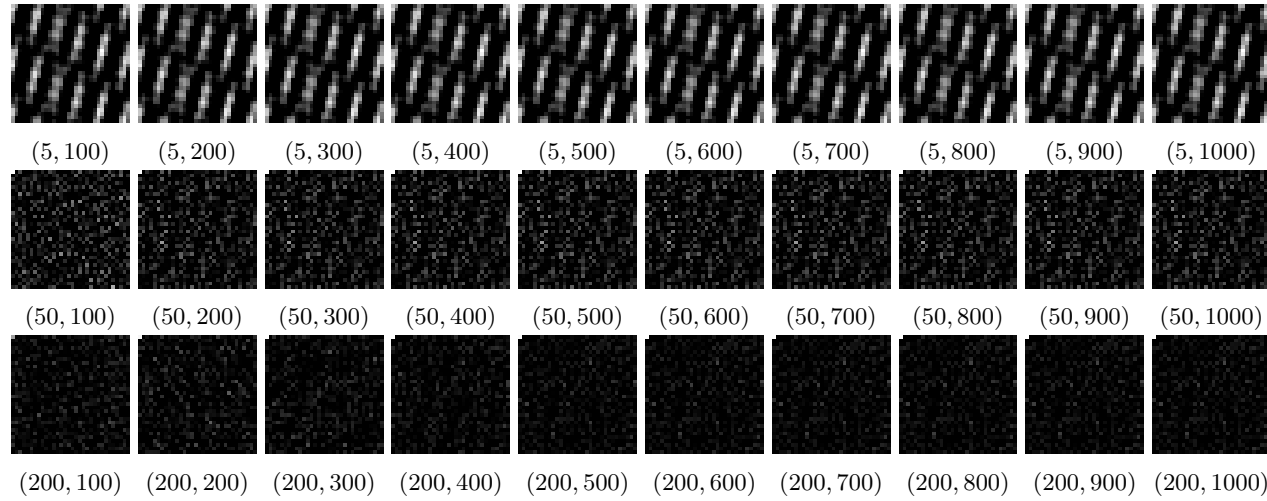


Figure 3: Each OMP image line is variation with  $m$  for a fixed  $k$ , caption format  $(k, m)$

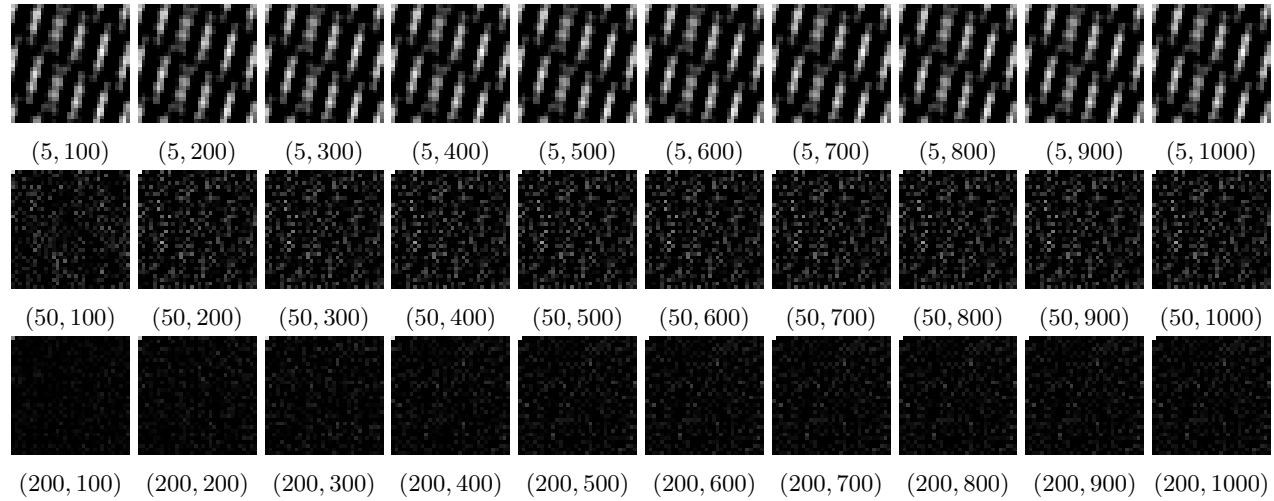


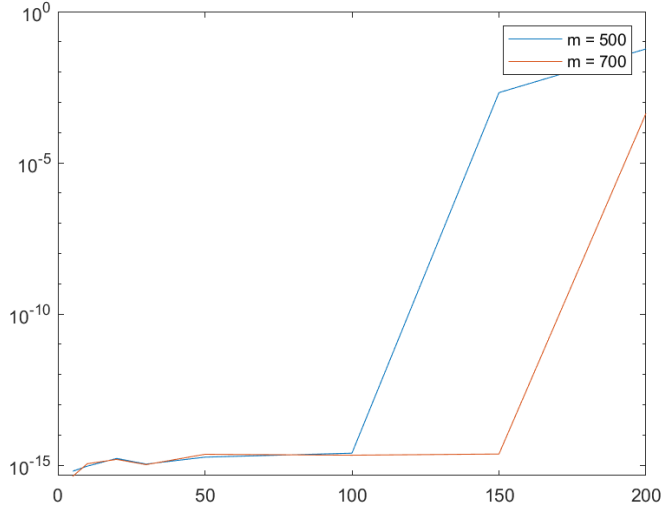
Figure 4: Each IHT image line is variation with  $m$  for a fixed  $k$ , caption format  $(k, m)$

### 2.3 Task 3

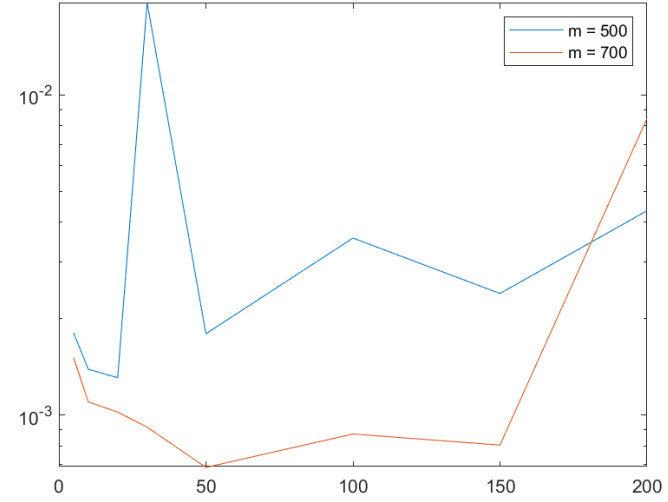
For  $m \in \{500, 700\}$  and  $k \in \{5, 10, 20, 30, 50, 100, 150, 200\}$ .

RMSE plots are shown in 5 and reconstructed images are shown in 6 and 7.

Reconstructed images are very similar to the original images and the RMSE plots indicates (with some exceptions) that for higher  $m$ , higher  $k$  (sparsity) can be handled before the RMSE increases.



(a) OMP



(b) IHT

Figure 5: Comparison of OMP and IHT plots for variation with  $k$  for a fixed  $m$

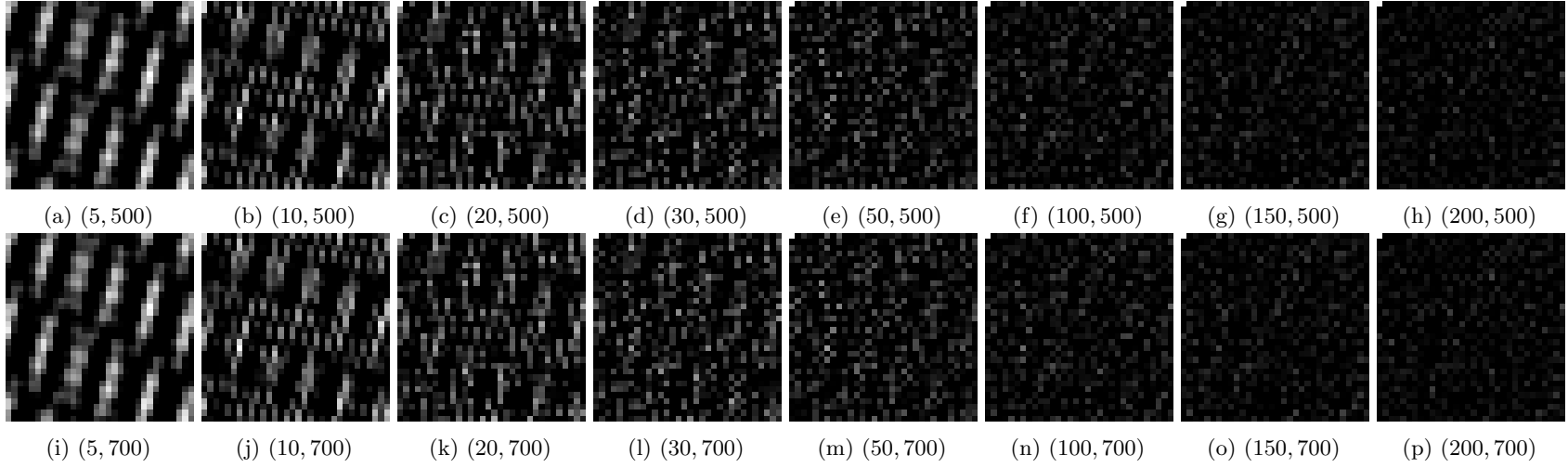


Figure 6: Each OMP image line is variation with  $k$  for a fixed  $m$ , caption format  $(k, m)$

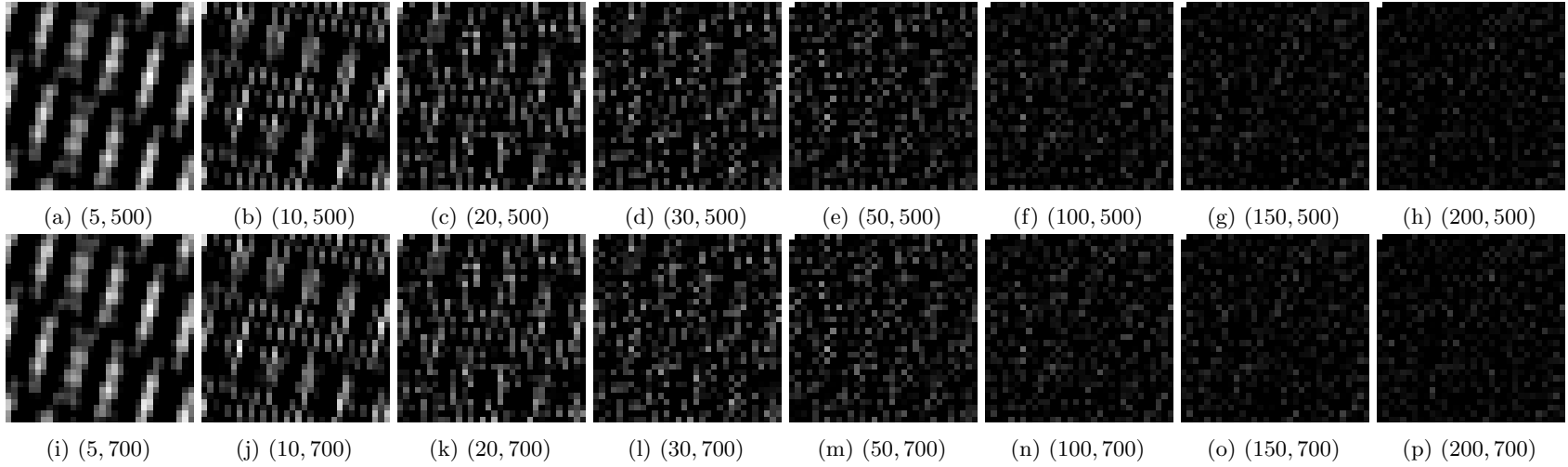


Figure 7: Each IHT image line is variation with  $k$  for a fixed  $m$ , caption format  $(k, m)$