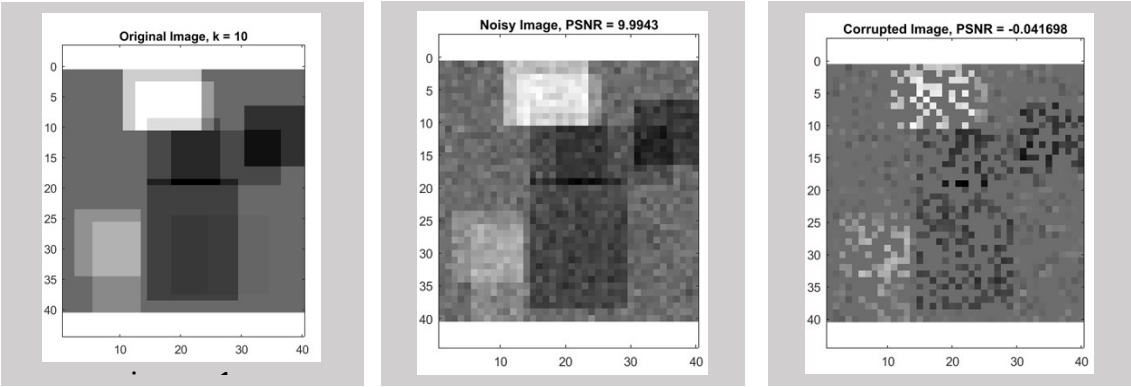
# Final Project Report

## Part A – Data Construction:

Discuss advice 2:

CA can contain null columns, this can be alleviated with adding small epsilon when constructing the normalized version of CA

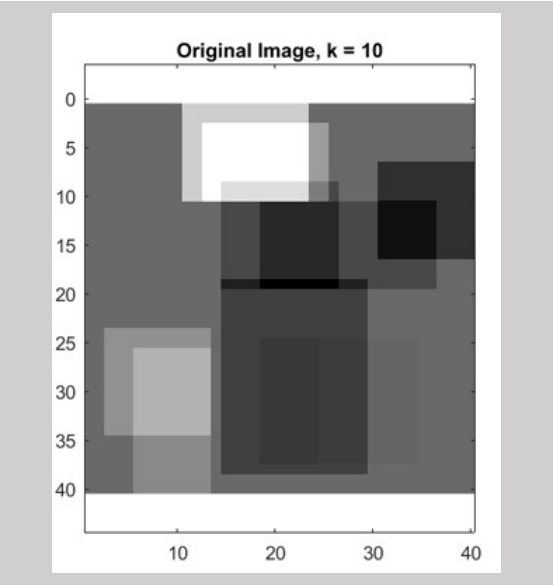
Show two clean images and their corresponding noisy and corrupted versions

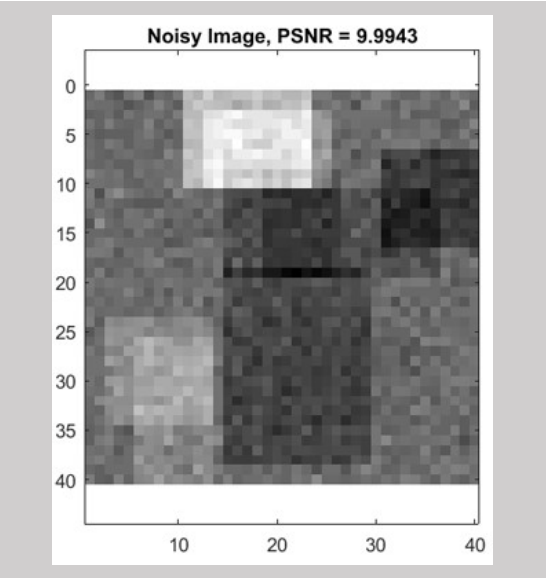


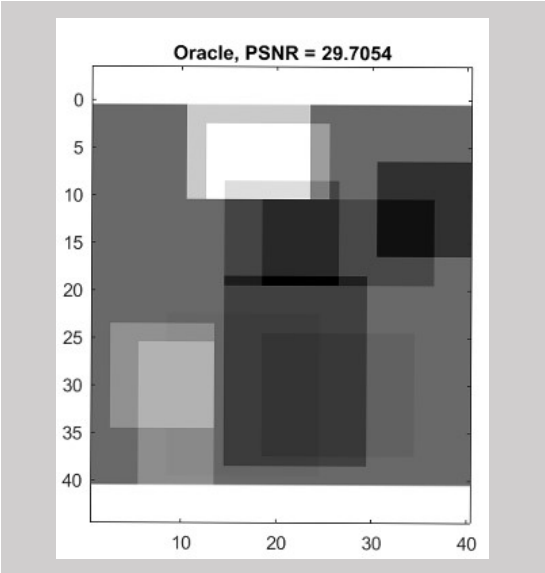
## Part B – Inpainting by the Oracle Estimator

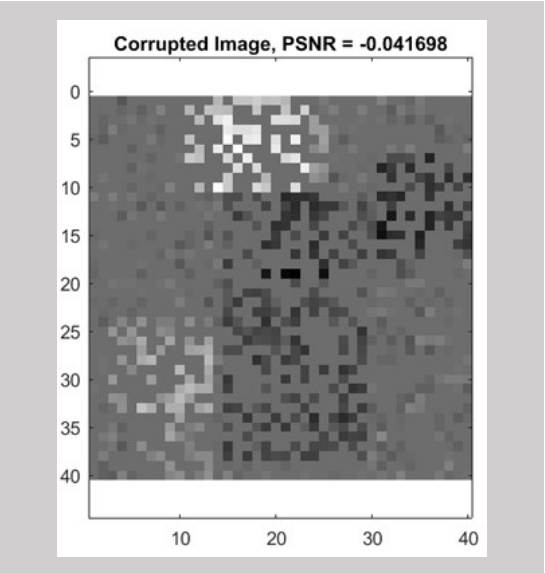
Insert average PSNR result of the Oracle estimator: 28.485

Show clean, noisy, corrupted and Oracle-based reconstruction:



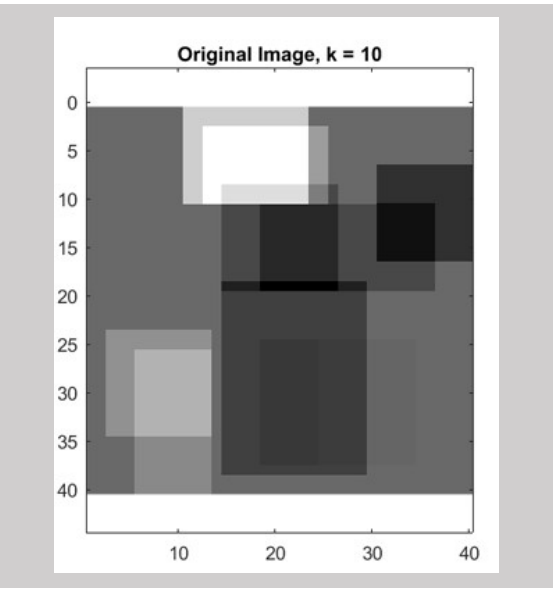



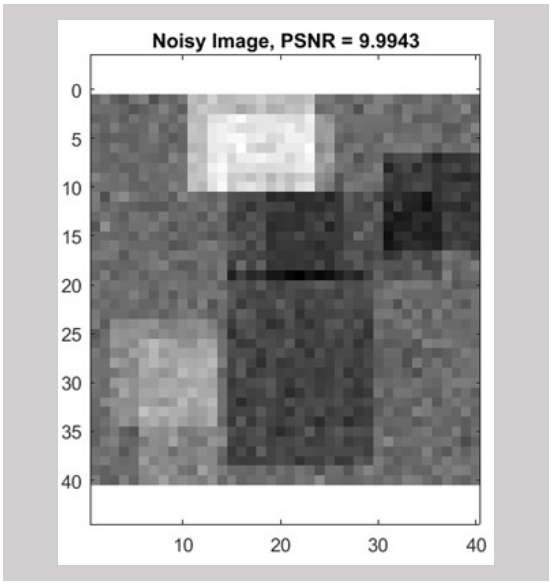



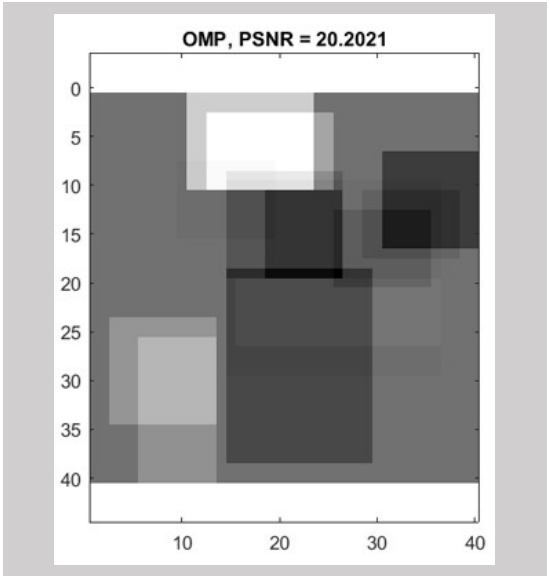
## Part C – Inpainting by Greedy Pursuit

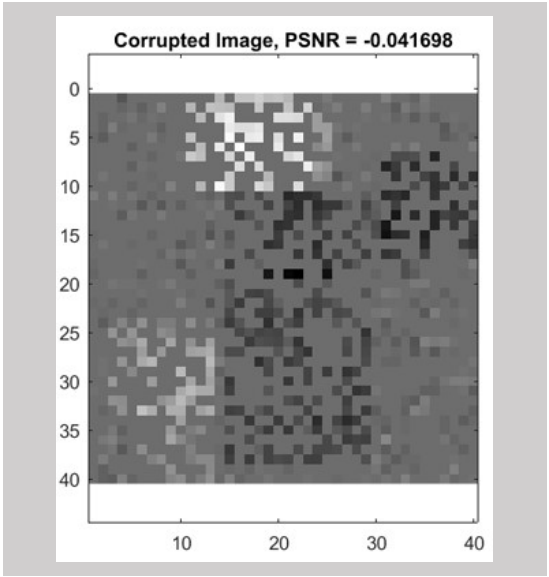
Insert average PSNR result of OMP: 21.093

Show clean, noisy, corrupted and OMP-based reconstruction:

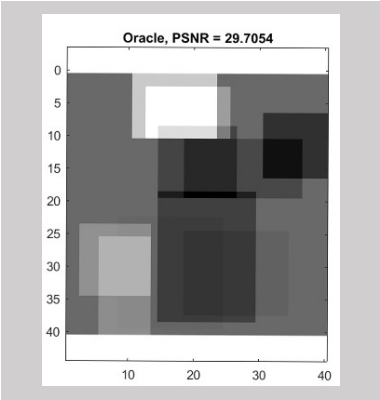


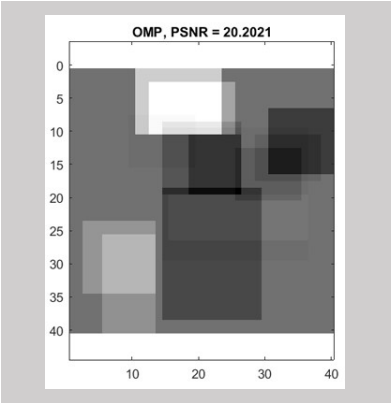



Compare between Oracle and OMP reconstructions:

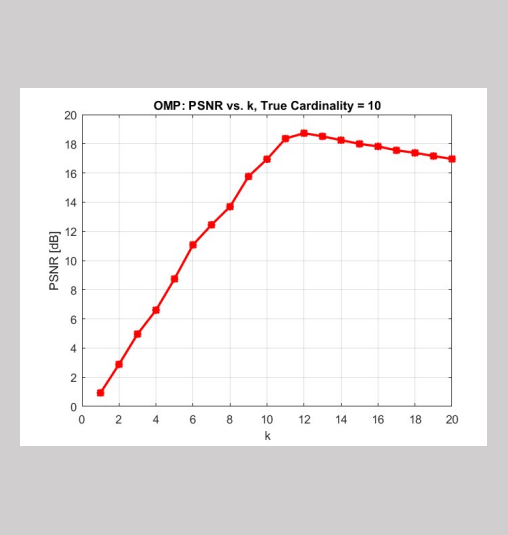



Discuss results of OMP and compare to Oracle performance:

Orcale reconstruction is quite good, compared to OMP

Show average PSNR of OMP as a function of $k$



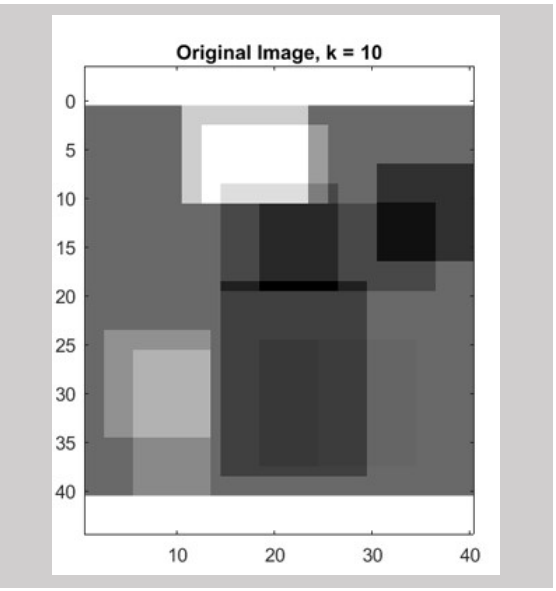

Discussion regarding the average PSNR as a function of $k$:

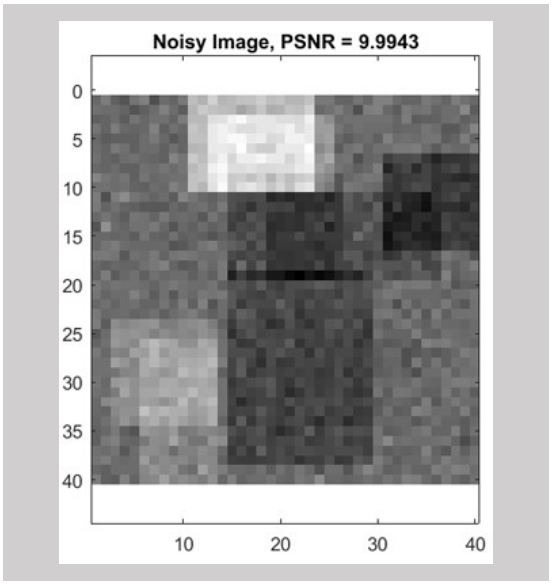
OMP can quite successfully reconstruct the image close to the true cardinality

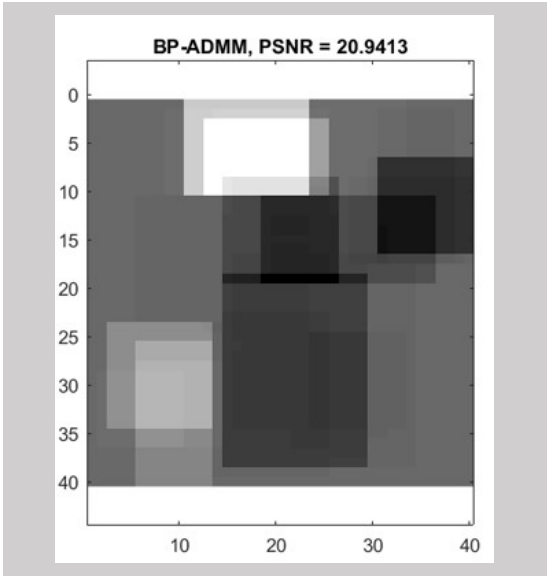
## Part D – Inpainting by Basis Pursuit

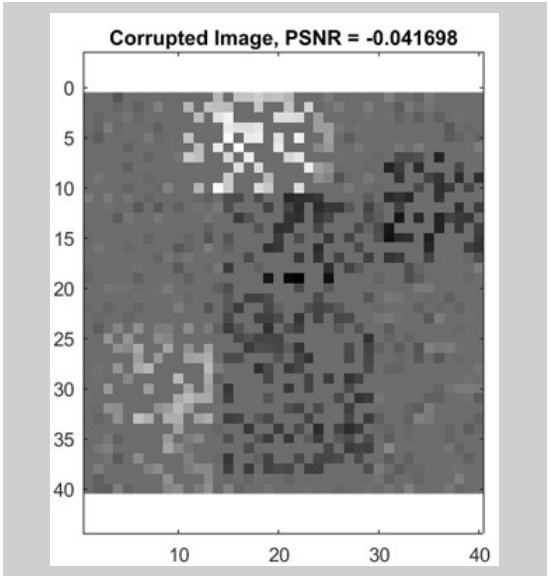
Insert average PSNR result of Basis-Pursuit: 19.027

Show clean, noisy, corrupted and BP-based reconstruction:

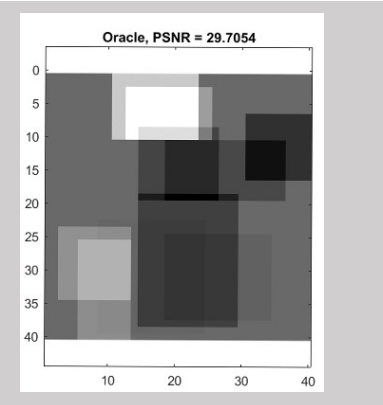


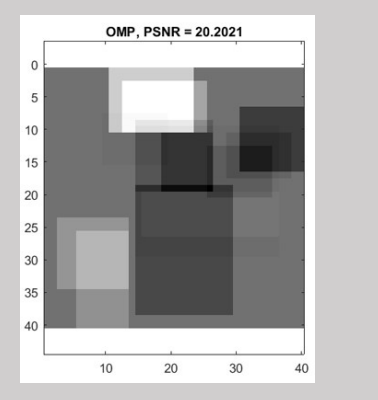



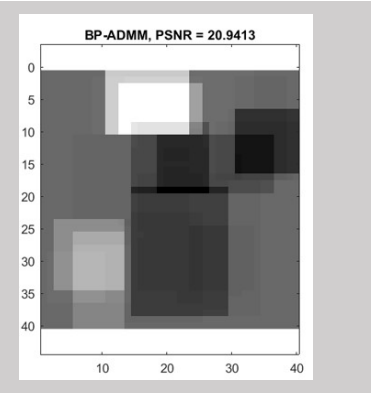



Compare between Oracle and OMP and BP reconstructions:



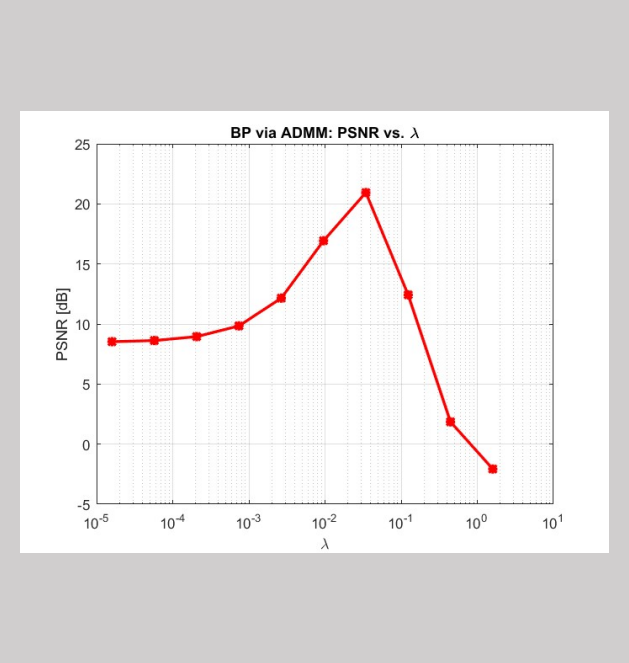




Discuss results of BP and compare to greedy methods and to the oracle performance:

Average BPADMM performance is lower than OMP in our case, but the best reconstruction here is better than OMP.

Show PSNR as a function of $\lambda$:

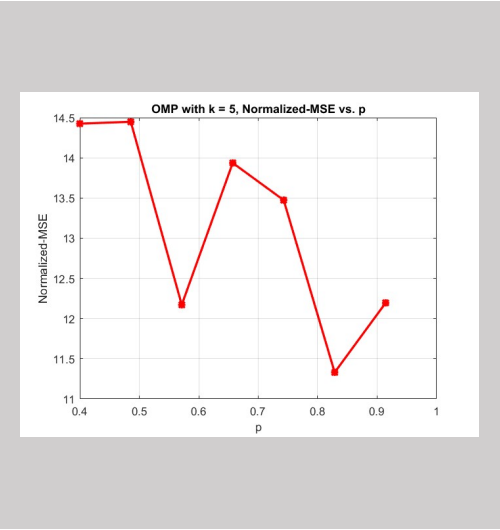


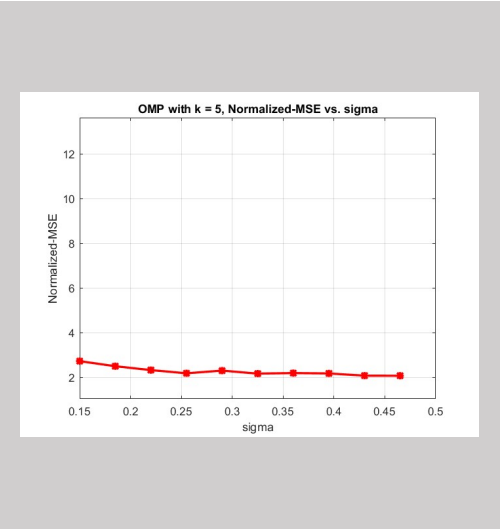

Discuss how $\lambda$ affects BP reconstruction:

Looks like there is only one lambda value that gets the best PSNR for reconstruction.

## Part E – Effect of Parameters

Show MSE as a function of $p$ and $\sigma$:




Discuss the effect of $p$:

Reconstruction when 0.8 of pixels are present gives the best results. Interesting is that after this best result, the reconstruction starts to show worse results after that.

Discuss the effect of $\sigma$:

The variance of the noise does not have a big impact over the reconstruction errors.