Sparse Coding Minimizing ℓ_0: Matching Pursuit
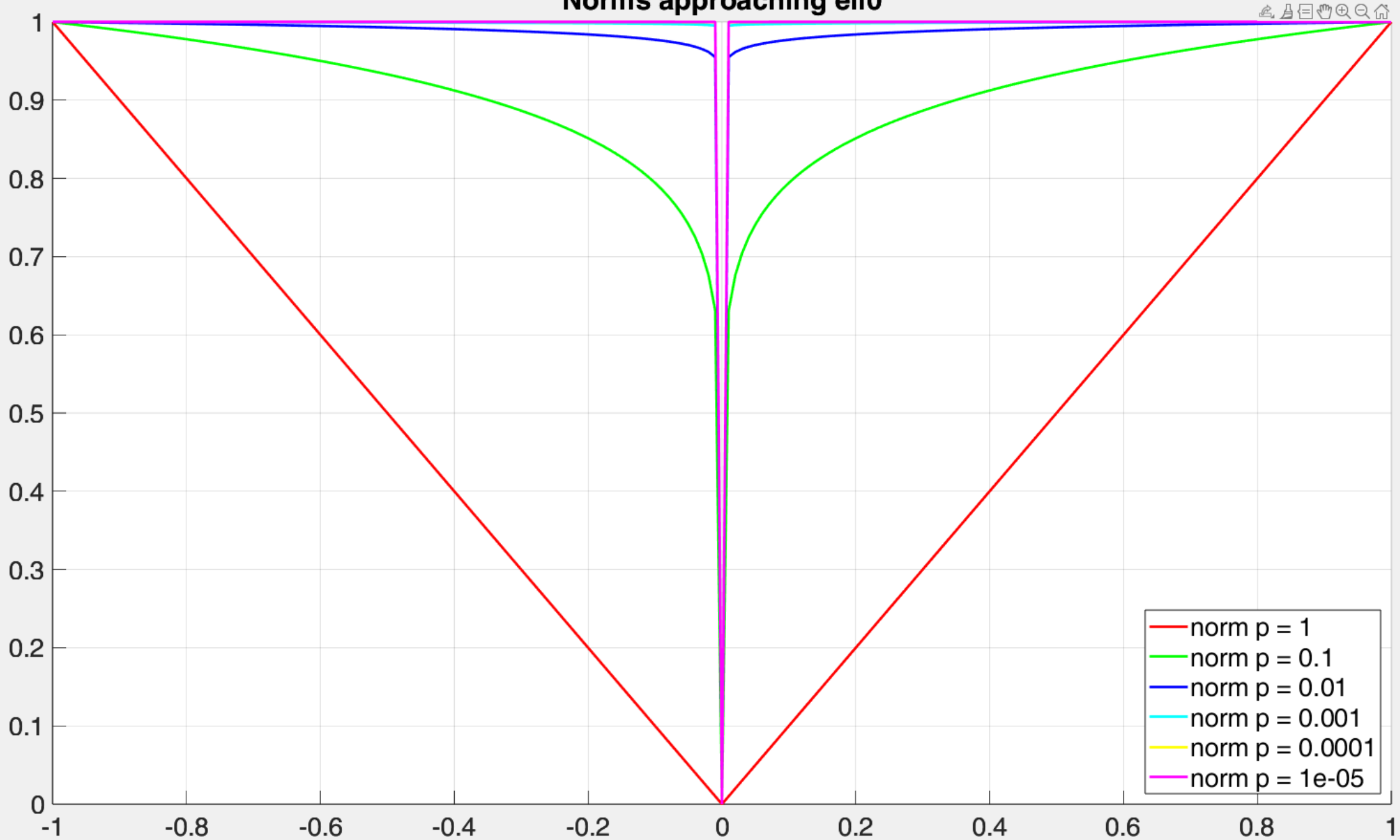
Mathematical Models and Methods for Image Processing

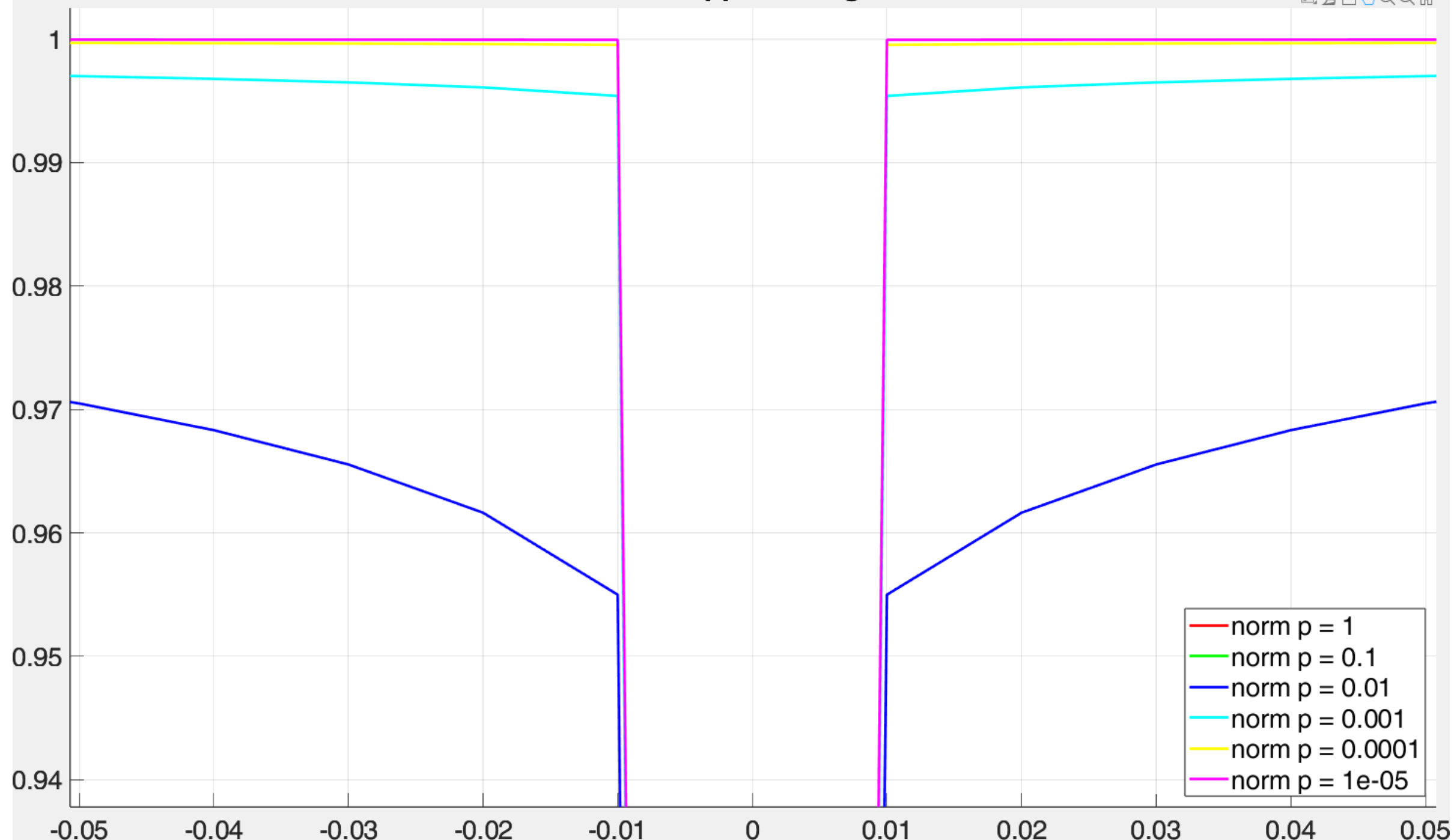Giacomo Boracchi

https://boracchi.faculty.polimi.it/

March 12th 2024

Norms approaching ell0

Norms approaching ell0

norm p = 1	
norm p = 0.1	
norm p = 0.01	
norm p = 0.001	
norm p = 0.0001	
norm p = 1e-05	

Assignment

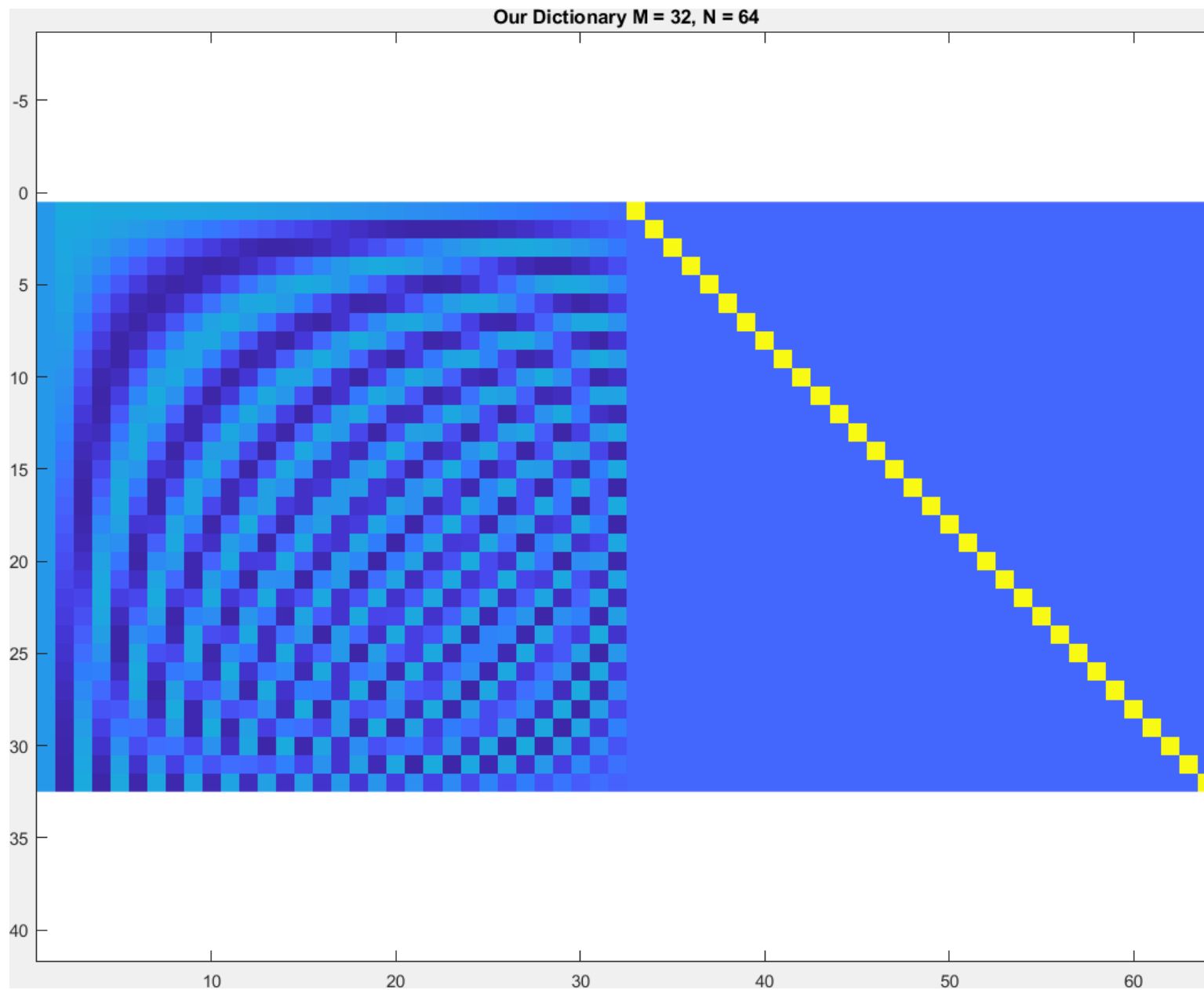Matching Pursuit

Implement the Matching Pursuit

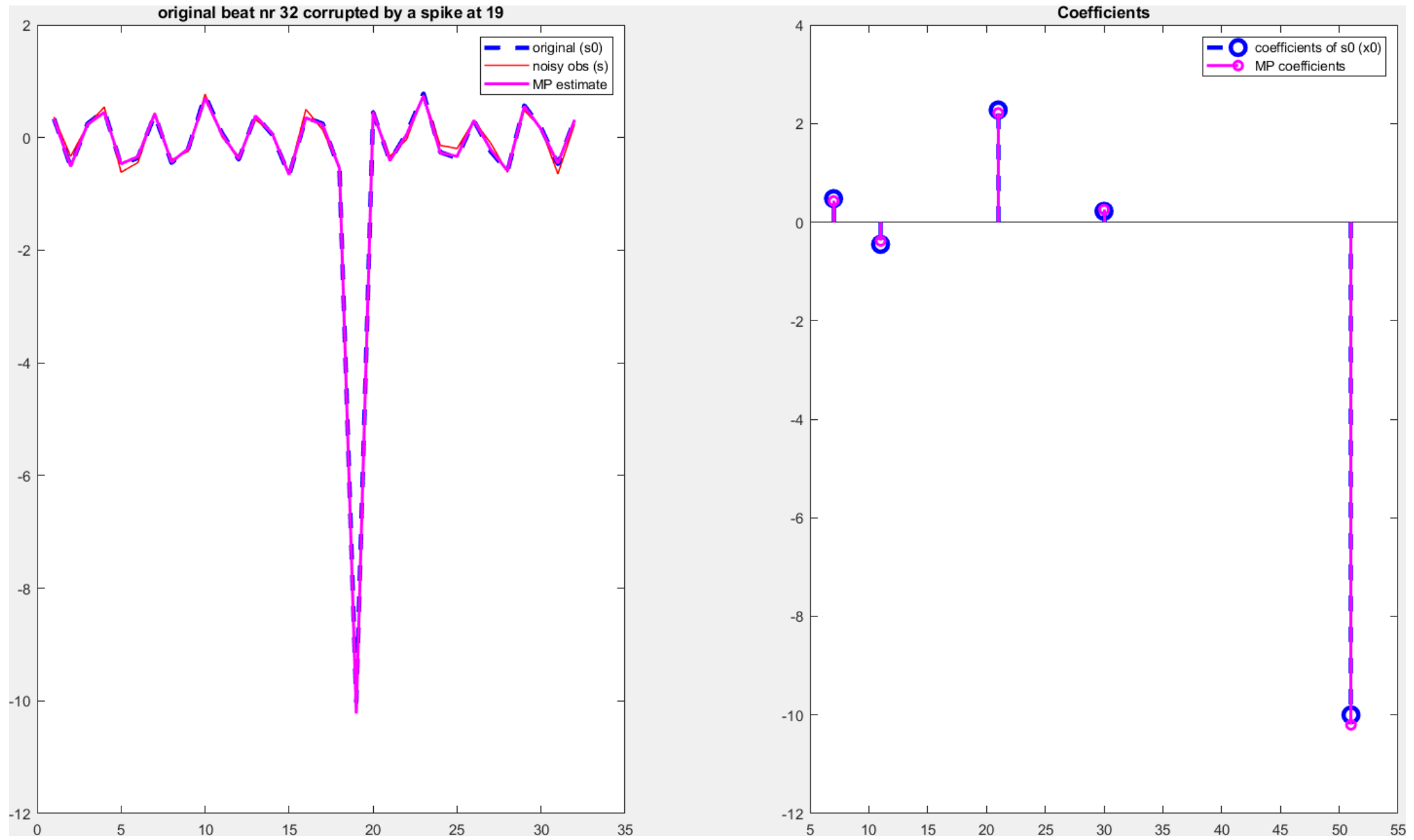Take the setup of Assignment 5 and:

- Implement matching pursuit to solve
$$\widehat{\boldsymbol{x}} = \underset{\boldsymbol{x} \in \mathbb{R}^M}{\operatorname{argmin}} \|\boldsymbol{x}\|_0 \quad \text{s.t.} \quad D\boldsymbol{x} = \boldsymbol{s}$$

- Where $D = [DCT, C]$ and $\boldsymbol{s}$ is an $L-$sparse signal w.r.t DCT and $1-$sparse signal w.r.t. the canonical basis C

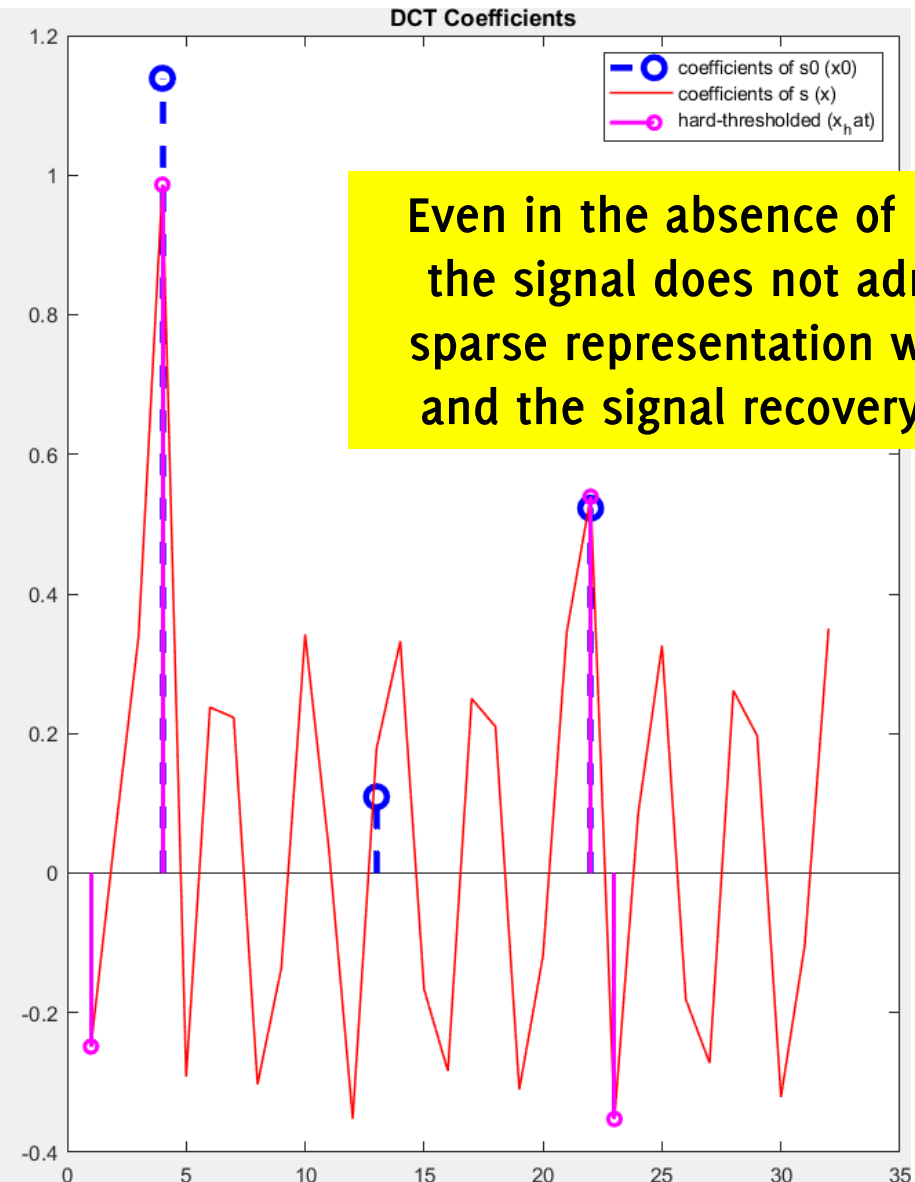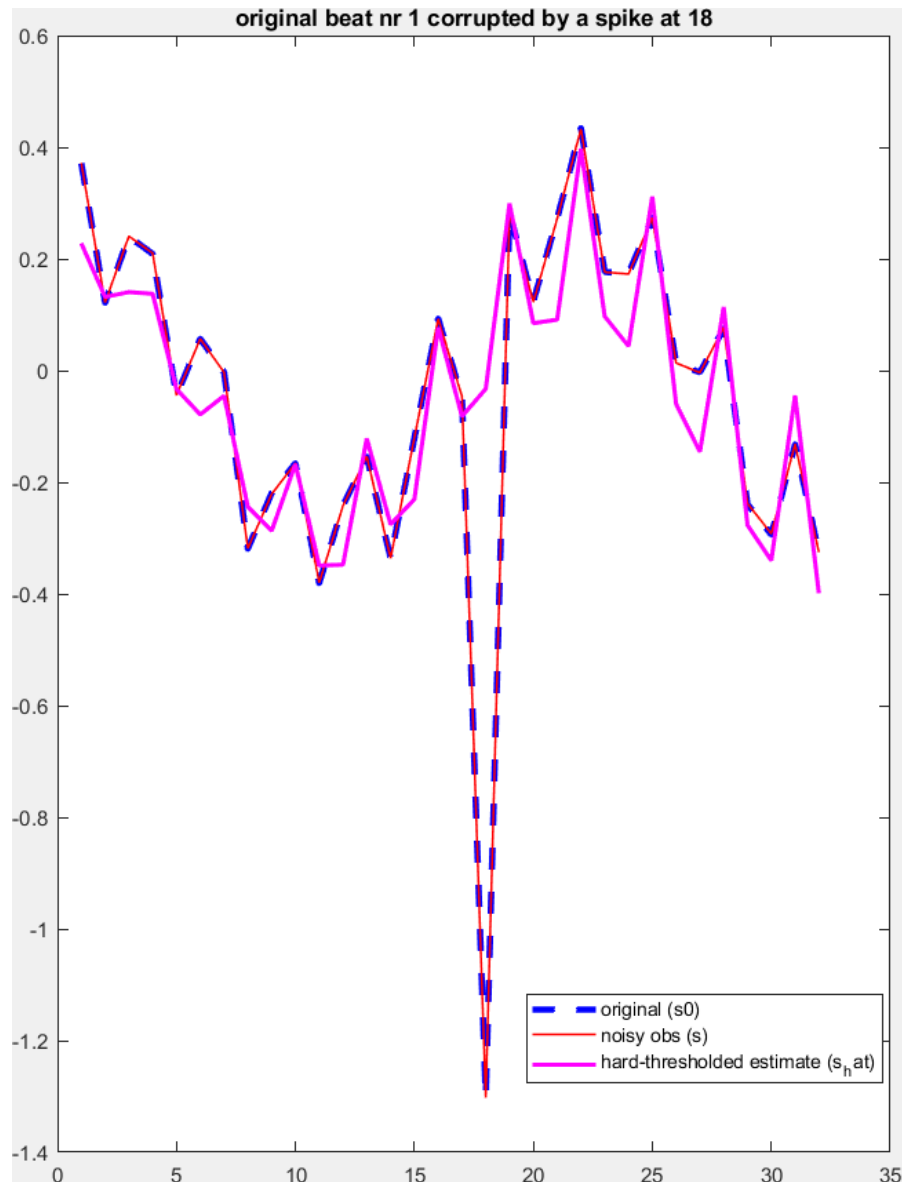- Implement the Matching Pursuit algorithm and check the recevored support

The Dictionary

Our Dictionary M = 32, N = 64

Results of Sparse Coding w.r.t. $D = [DCT, C]$

G. Boracchi

Results of Orthogonal Projection over DCT

G. Boracchi