Sparse Coding Minimizing ℓ_0: Matching Pursuit

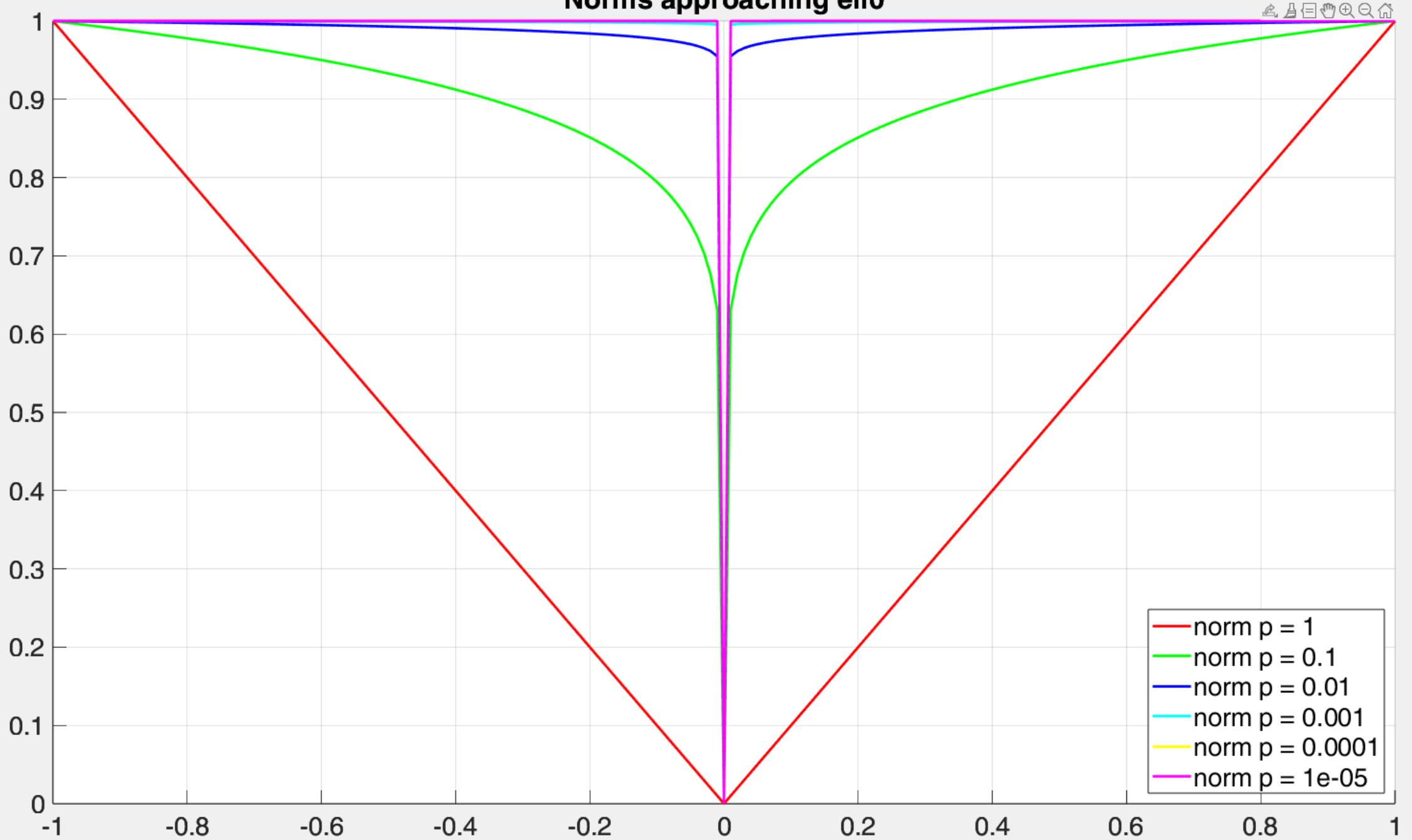## Mathematical Models and Methods for Image Processing

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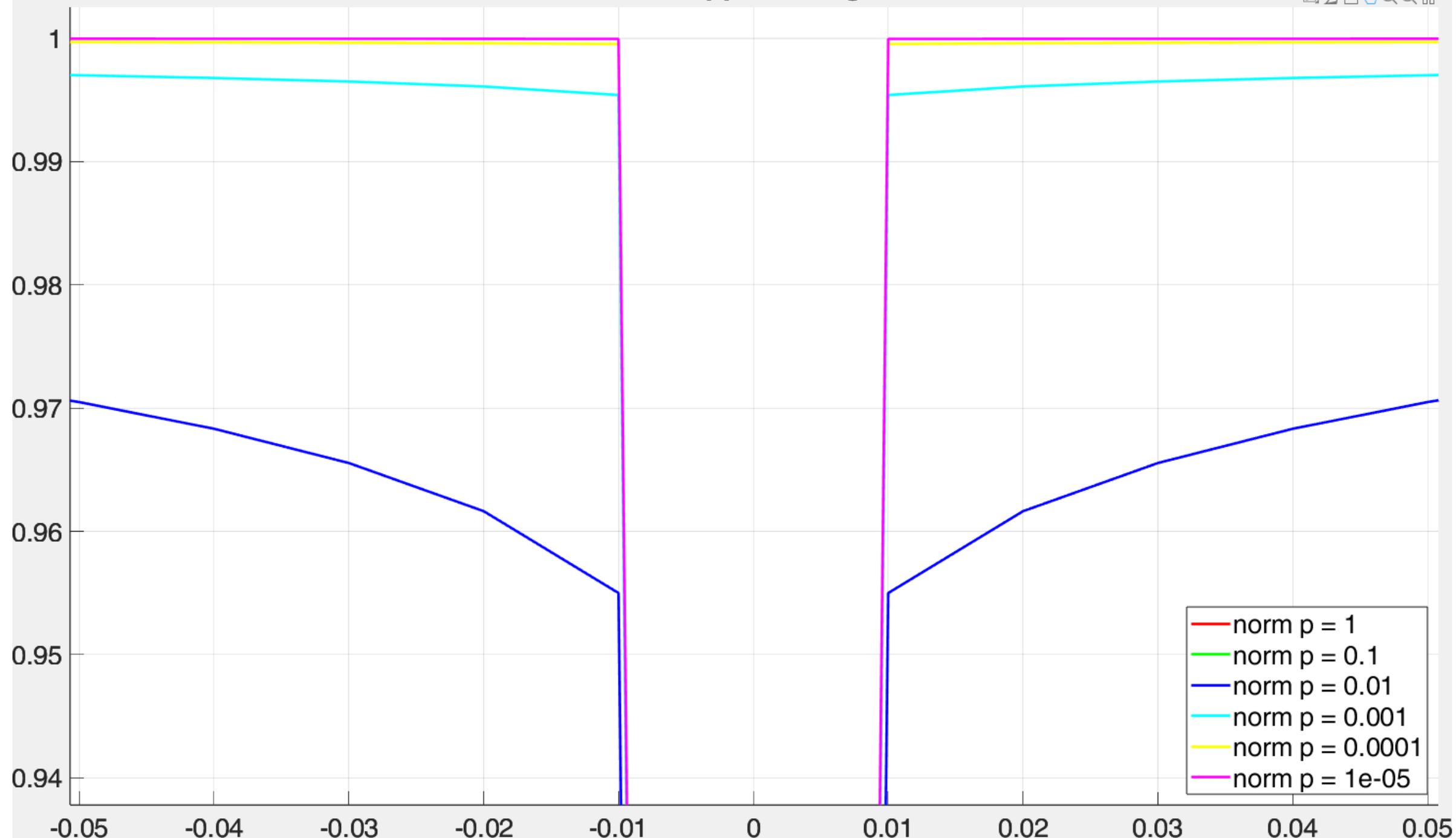
https://boracchi.faculty.polimi.it/

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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

Norms approaching ell0

Assignment

Matching Pursuit
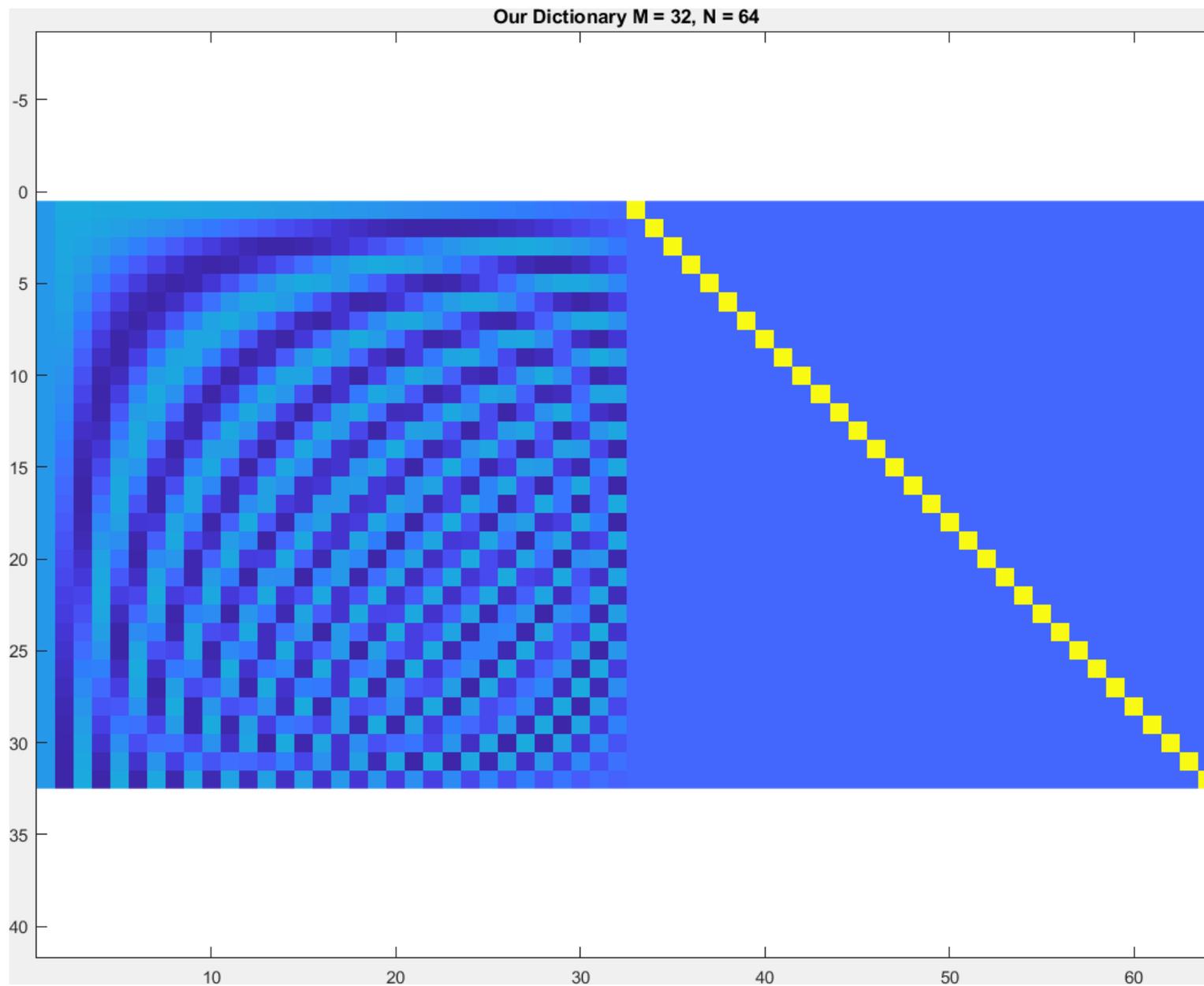
Implement the Matching Pursuit

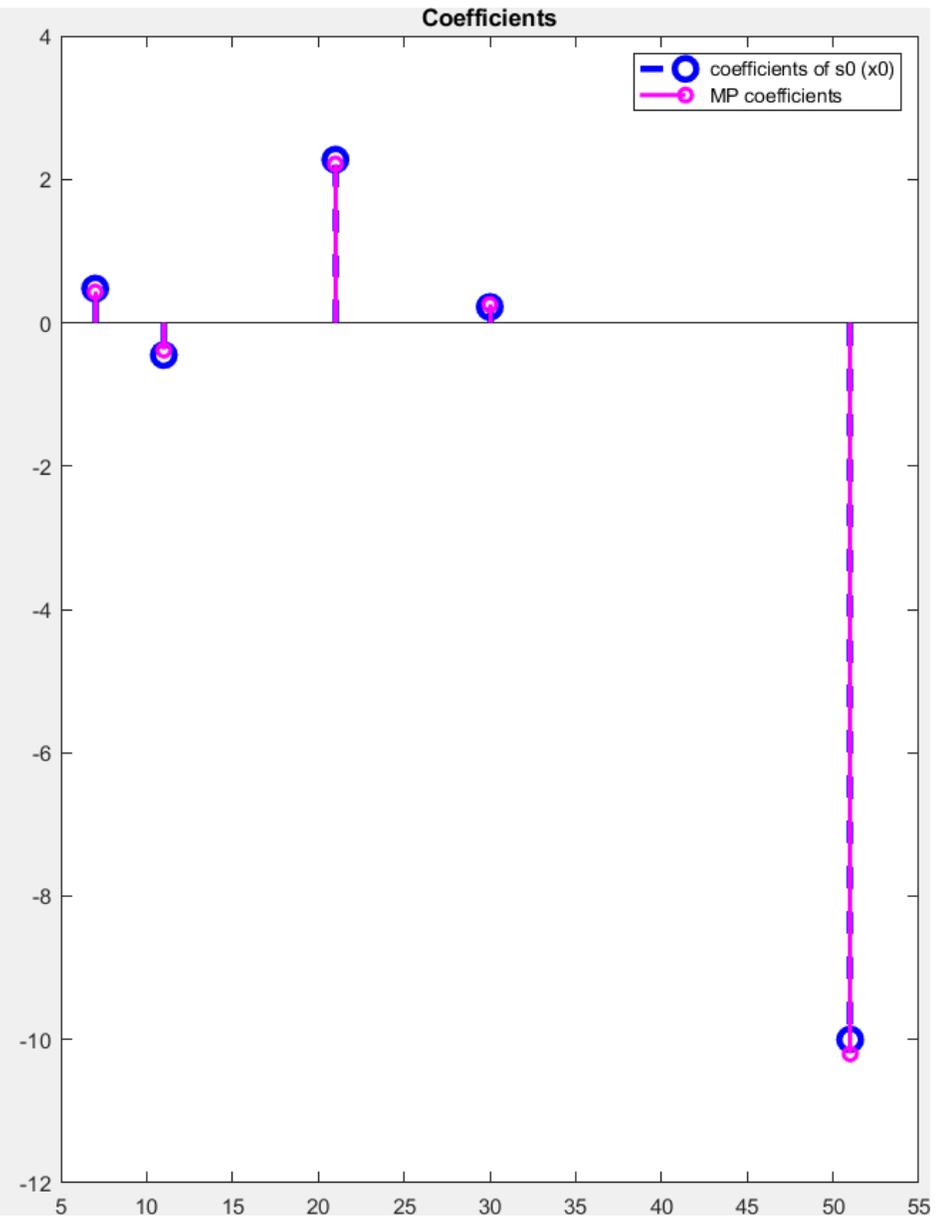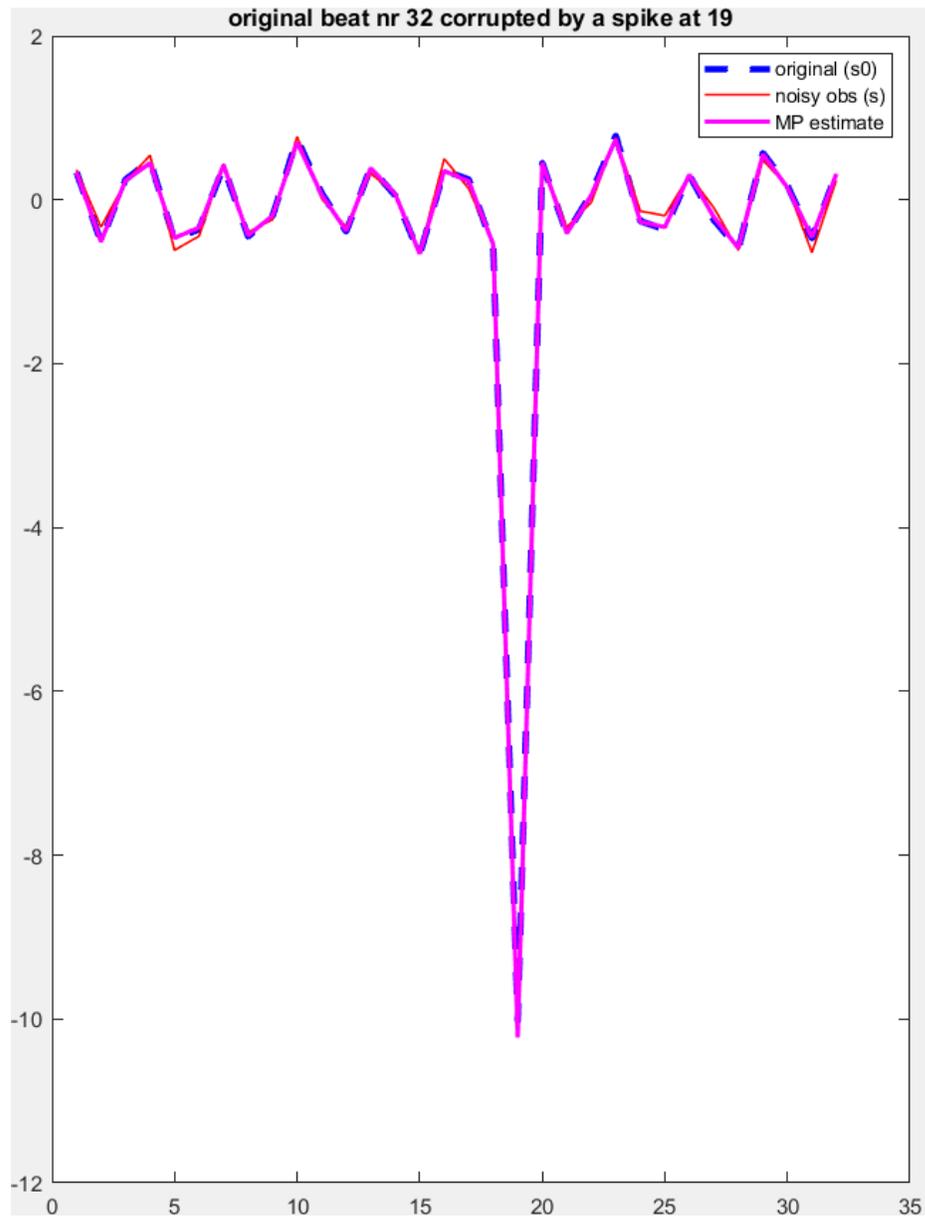Take the setup of Assignment 5 and:

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

- 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

Even in the absence of noise, the signal does not admit a sparse representation w.r.t. D and the signal recovery fails

G. Boracchi