Local Polynomial Approximation

Mathematical Models and Methods for Image Processing

Giacomo Boracchi

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

May 17th 2022

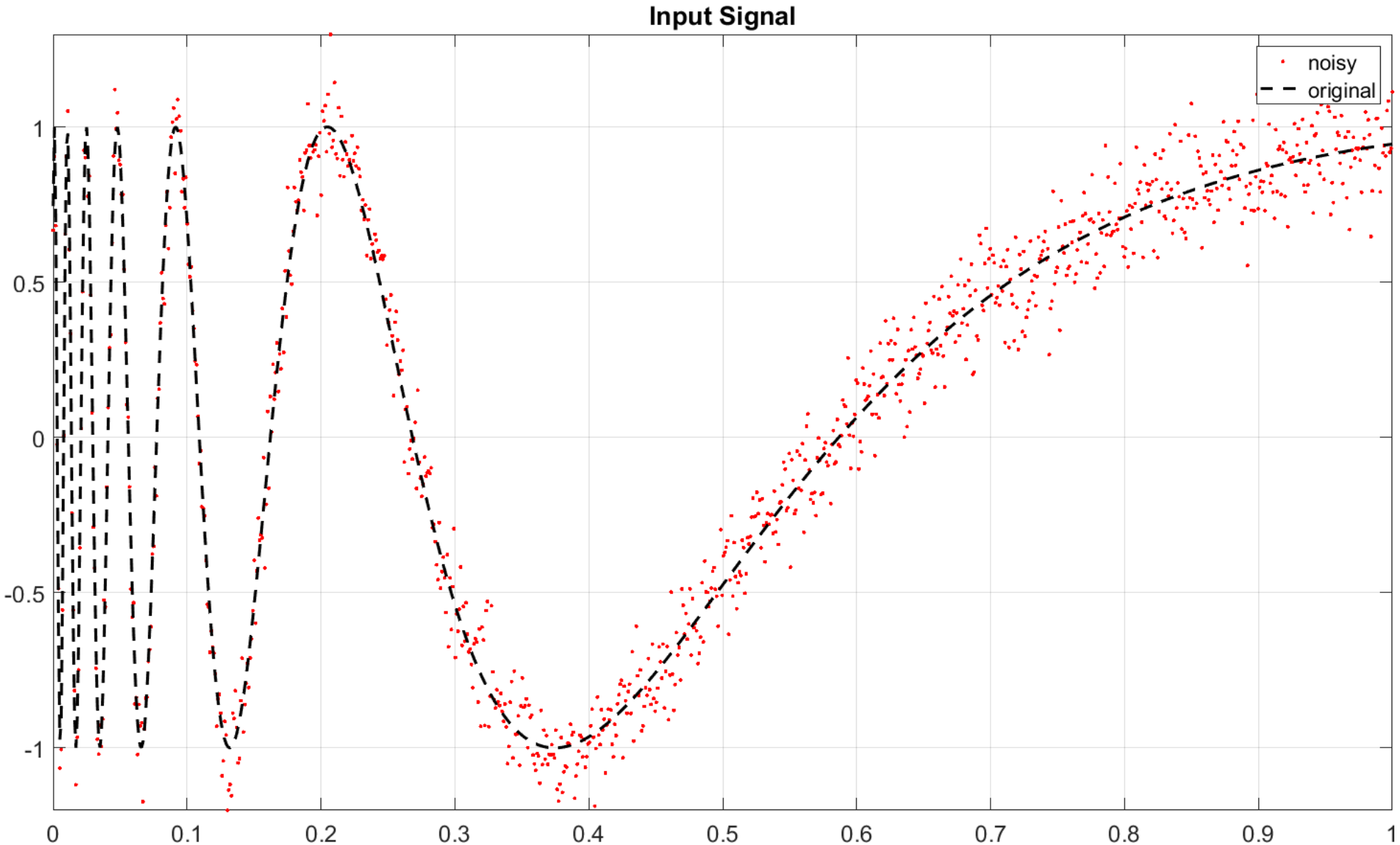
A. Foi, ***Anisotropic nonparametric image processing: theory, algorithms and applications***, Ph.D. Thesis, Dip. di Matematica, Politecnico di Milano, April 2005.

Assignment 1: LPA Kernels

Lez21_A_LPA

Define the LPA filters for a given polynomial order N and over a fixed support M to perform regression over noisy signals

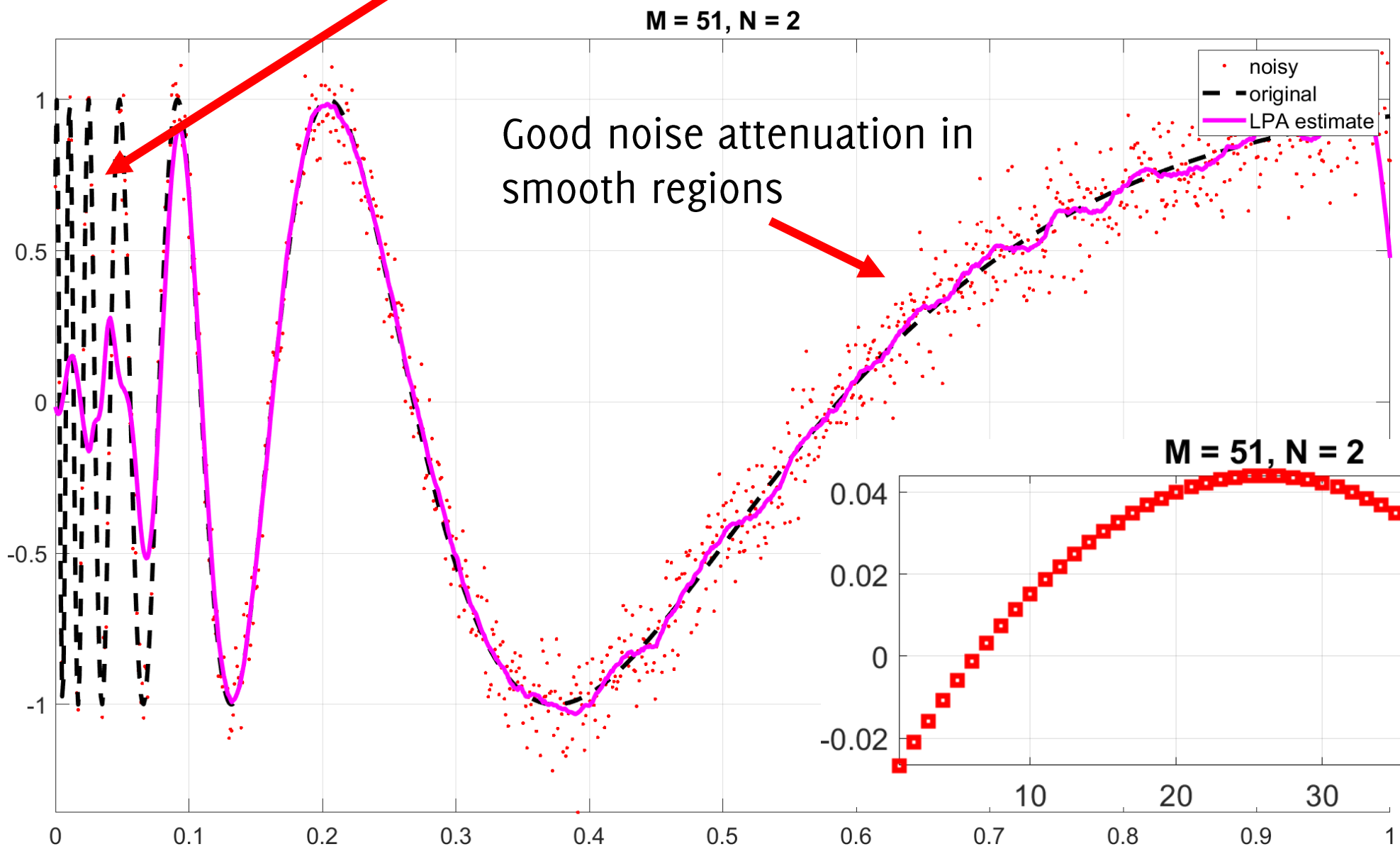
Noisy Signal



G. Boracchi

Large M, small N

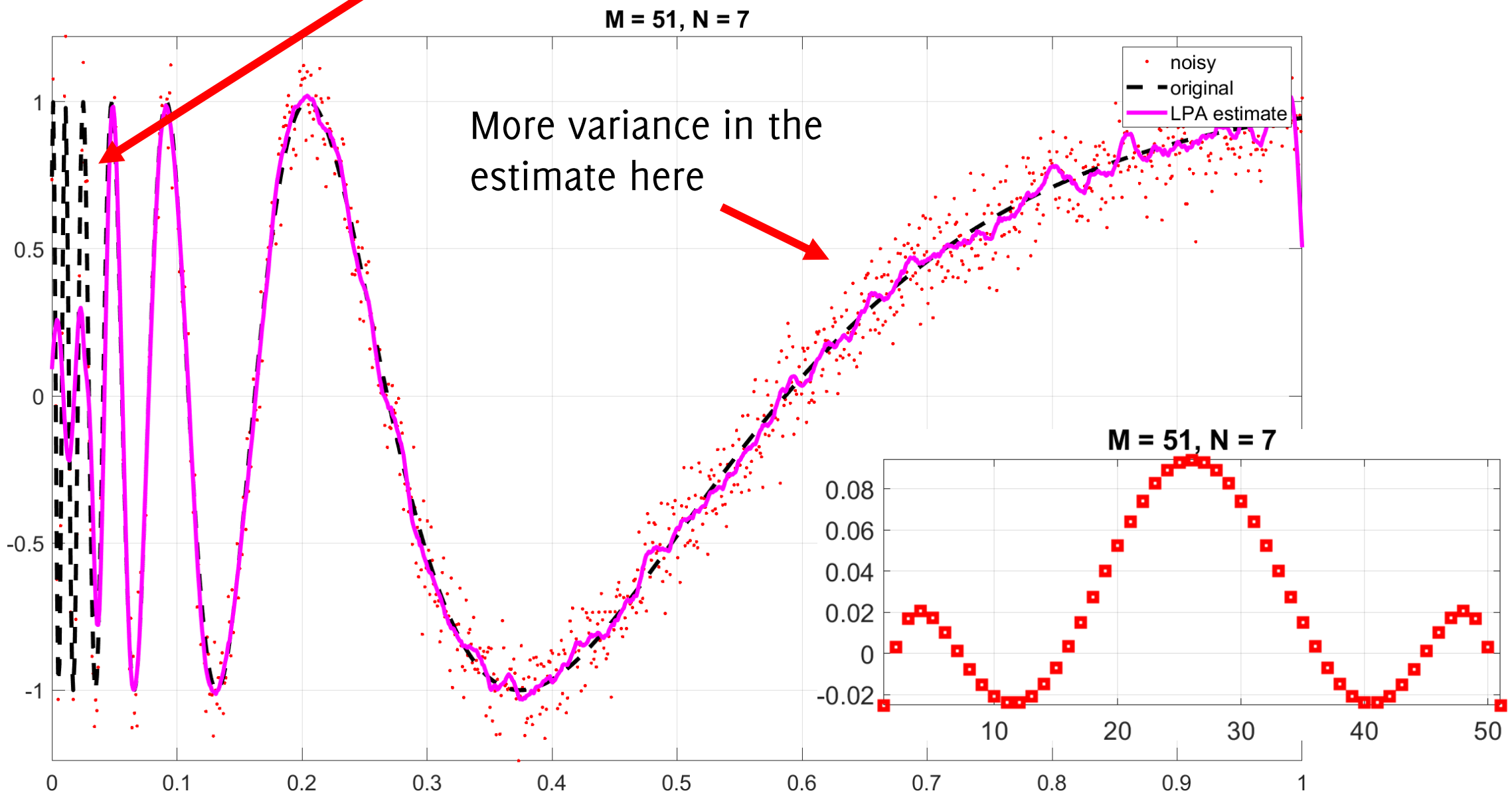
Biased estimate when the signal frequency is high



G. Boracchi

Large M, large N

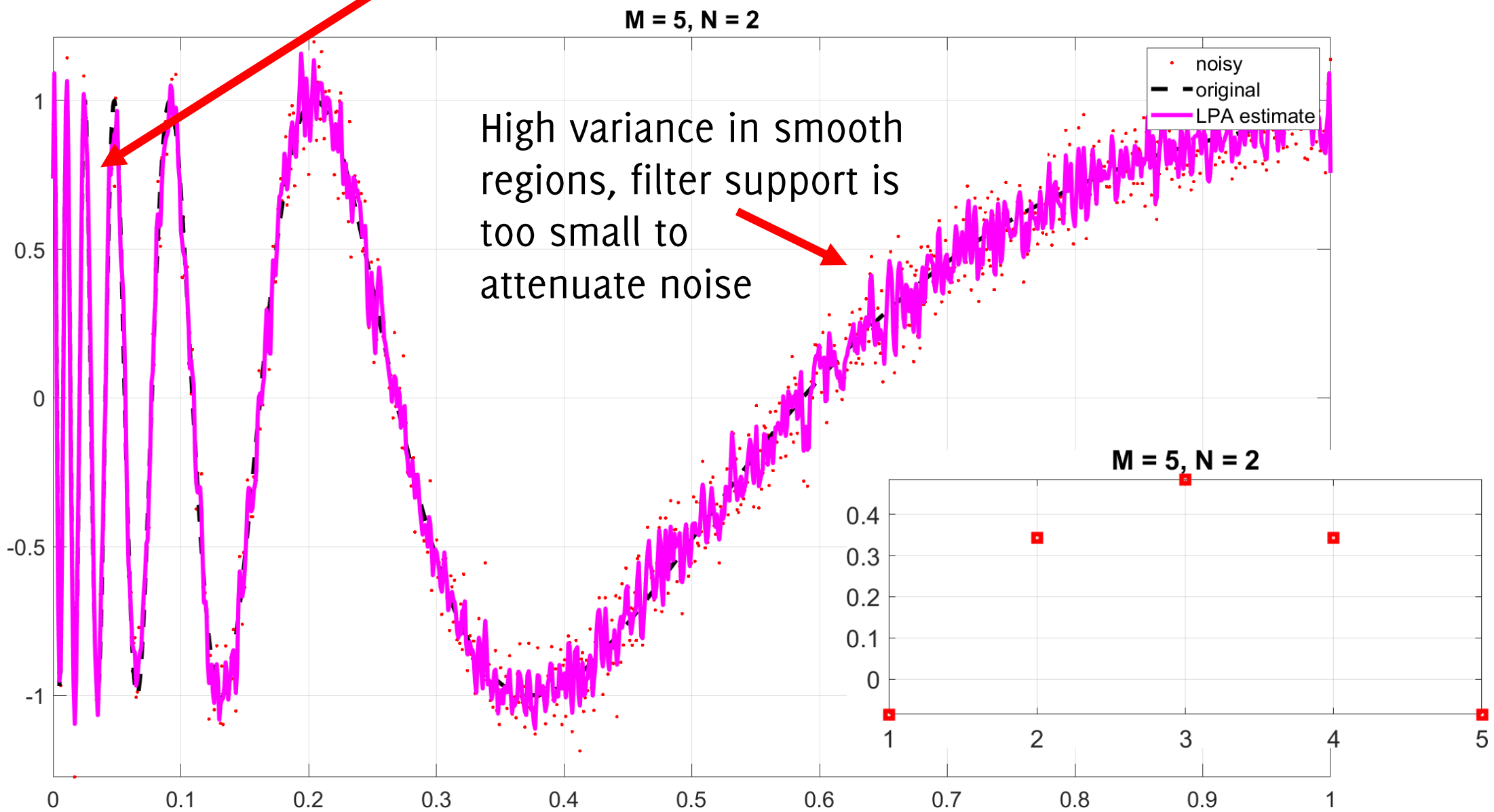
Lower bias than before when the signal frequency is high



G. Boracchi

small M, small N

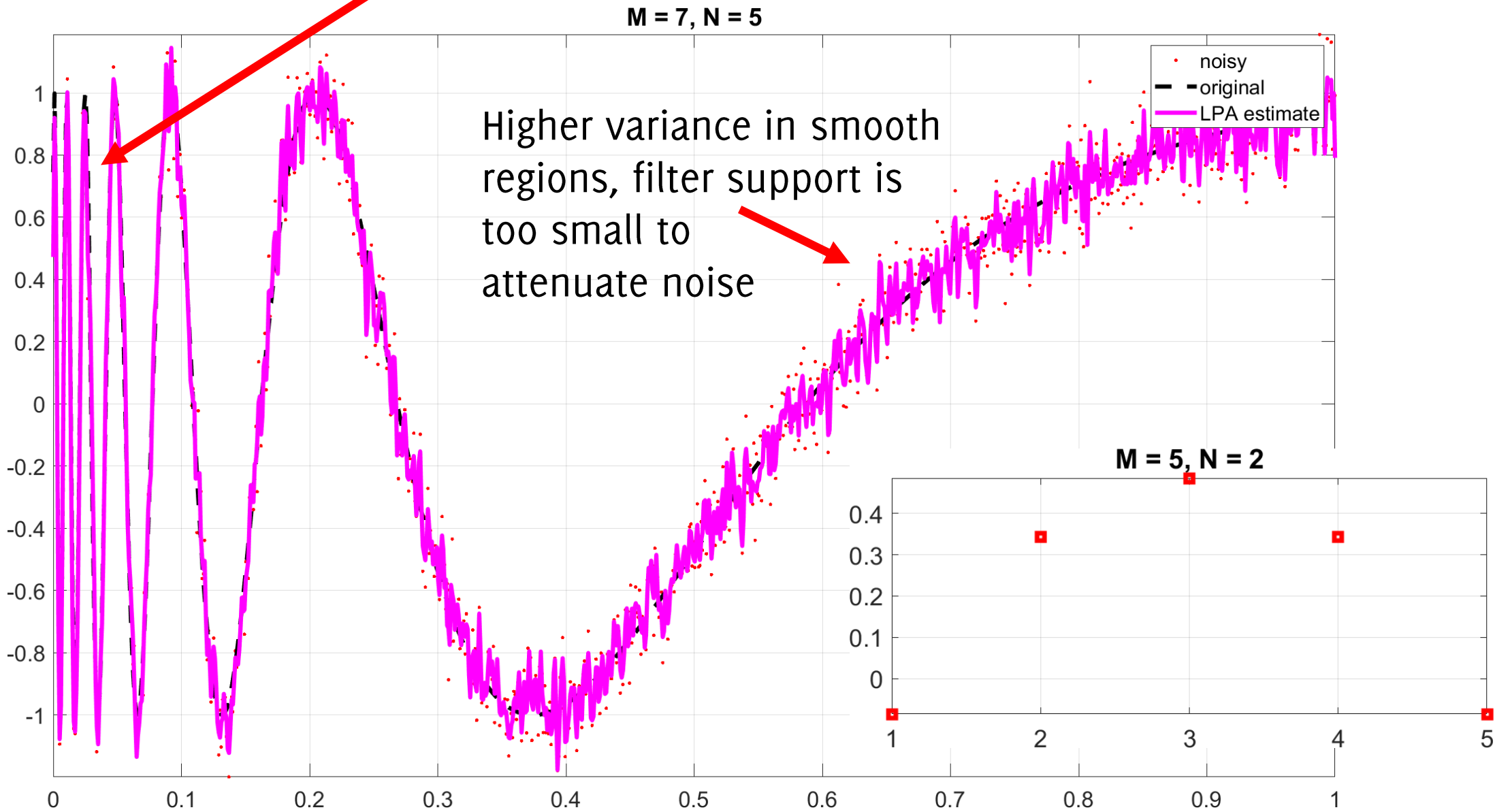
Lower bias than before when the signal frequency is high



G. Boracchi

small M, comparable N

Lower bias than before when the signal frequency is high



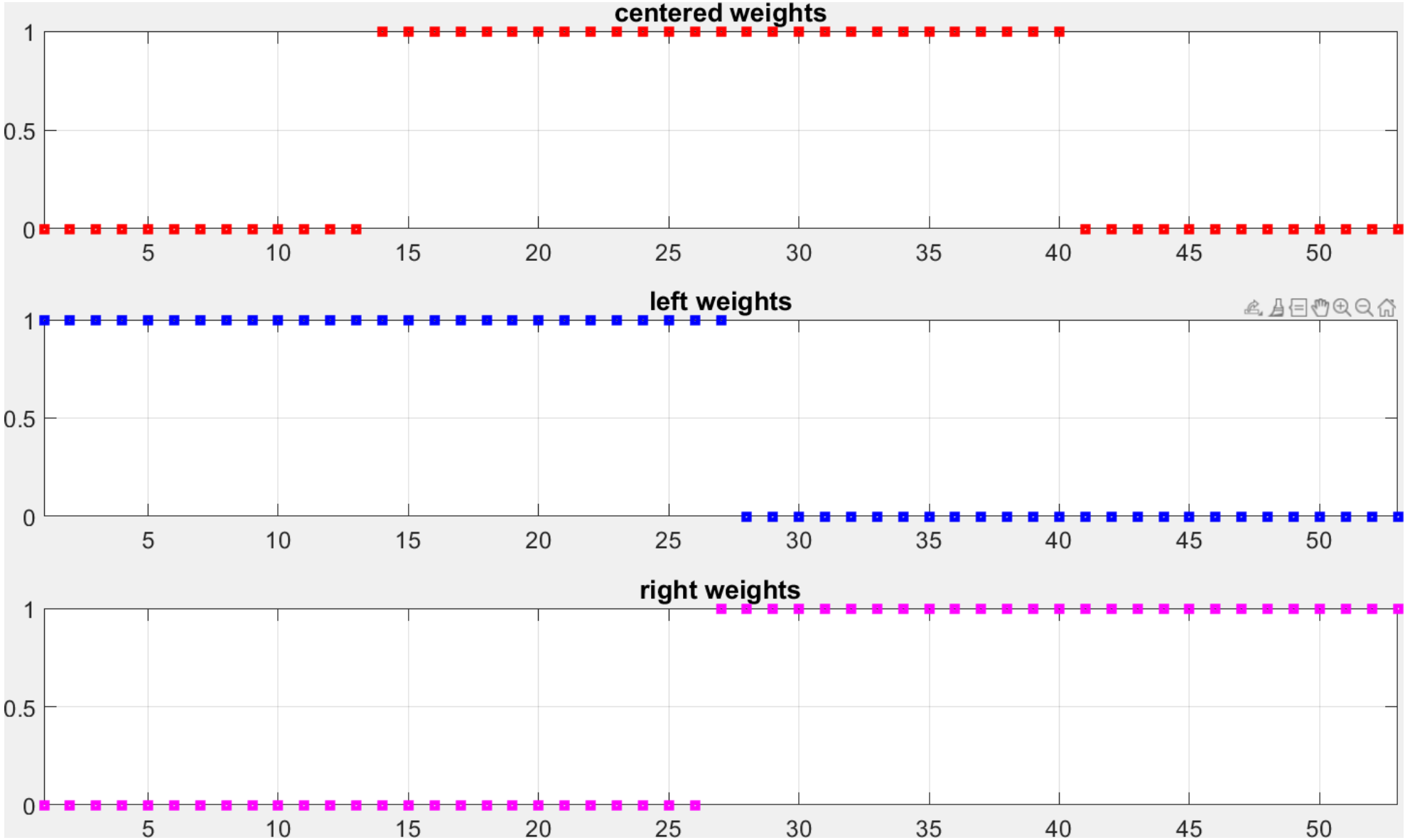
Assignment 2: Weighted LPA Kernels

Lez21_B_weighted_LPA

Define the **weighted LPA** filters for a given polynomial order N and over a fixed support M to perform regression over noisy signals

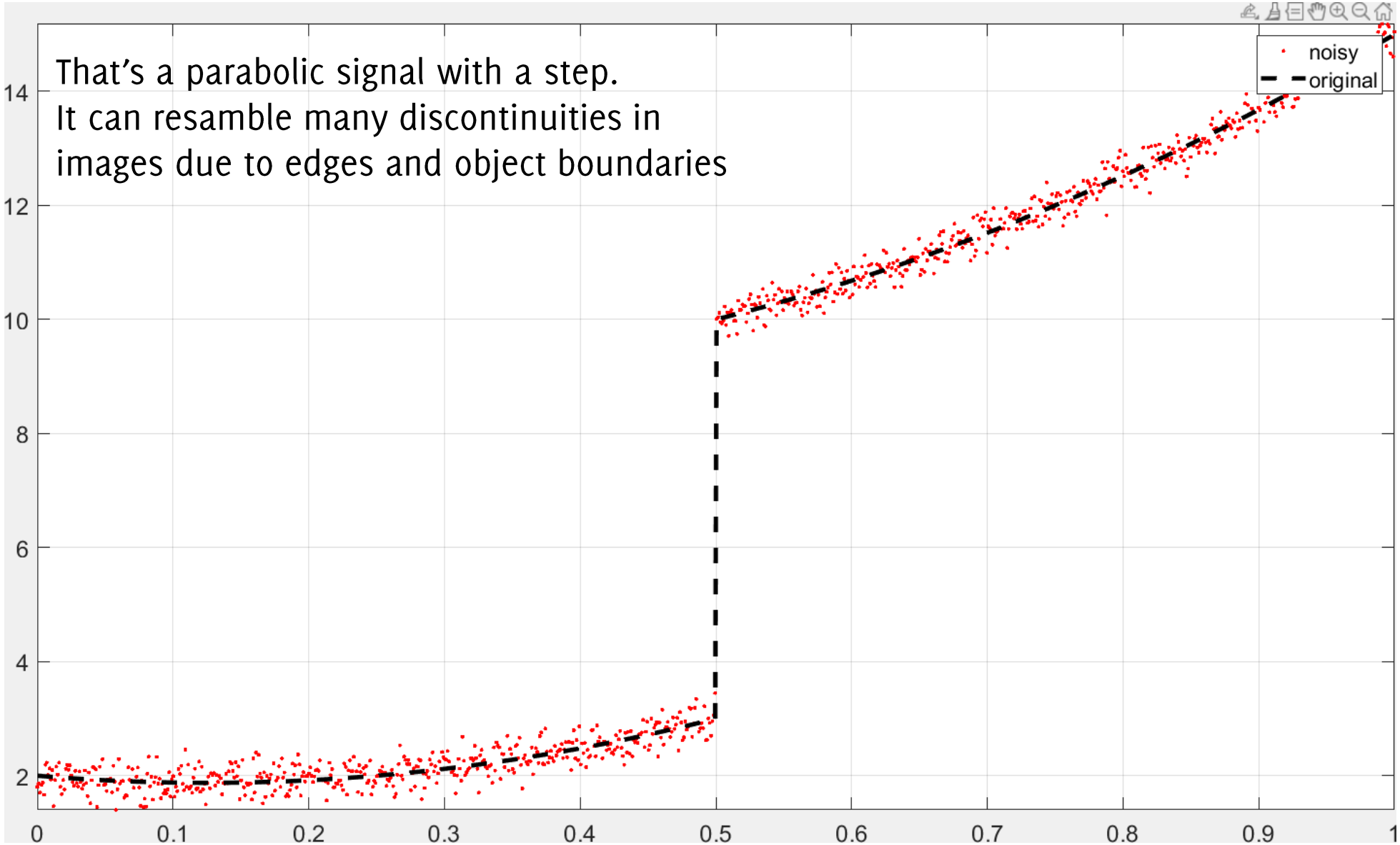
Use binary weights to compute centered, left and right estimates. See how these behave w.r.t. signal discontinuities

Example of binary weights to use



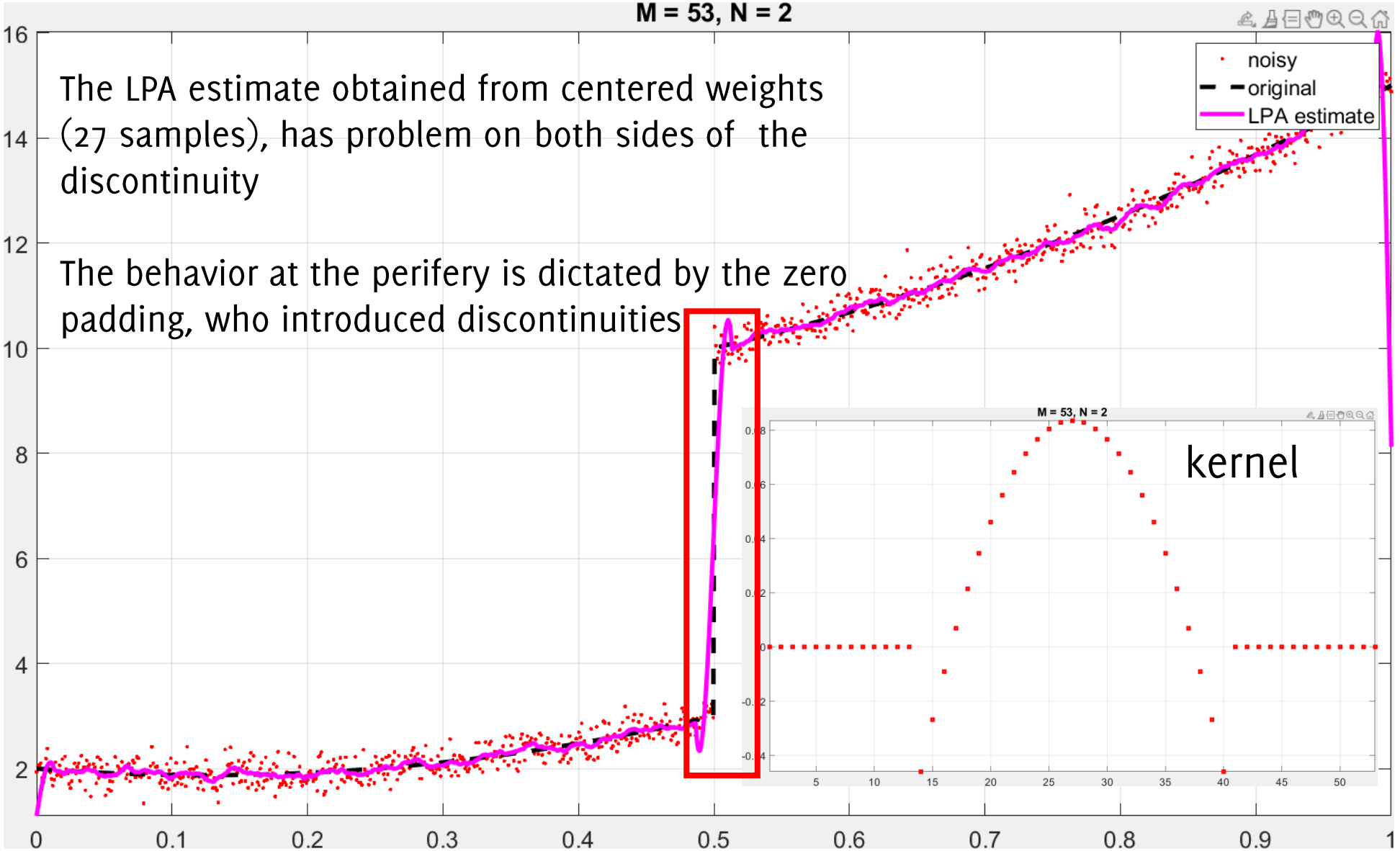
G. Boracchi

Handling Discontinuities



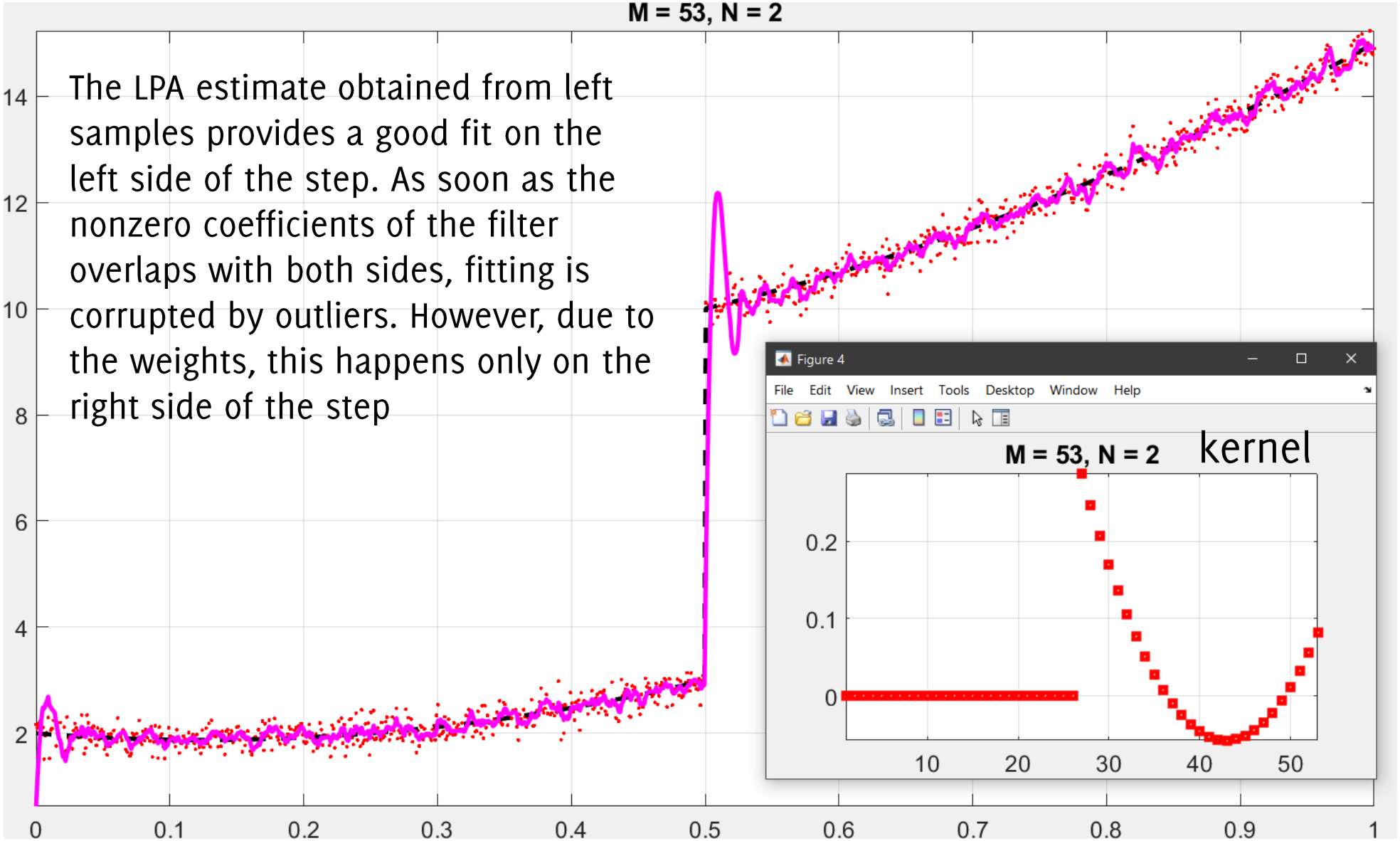
G. Boracchi

Handling Discontinuities: «centered weights»

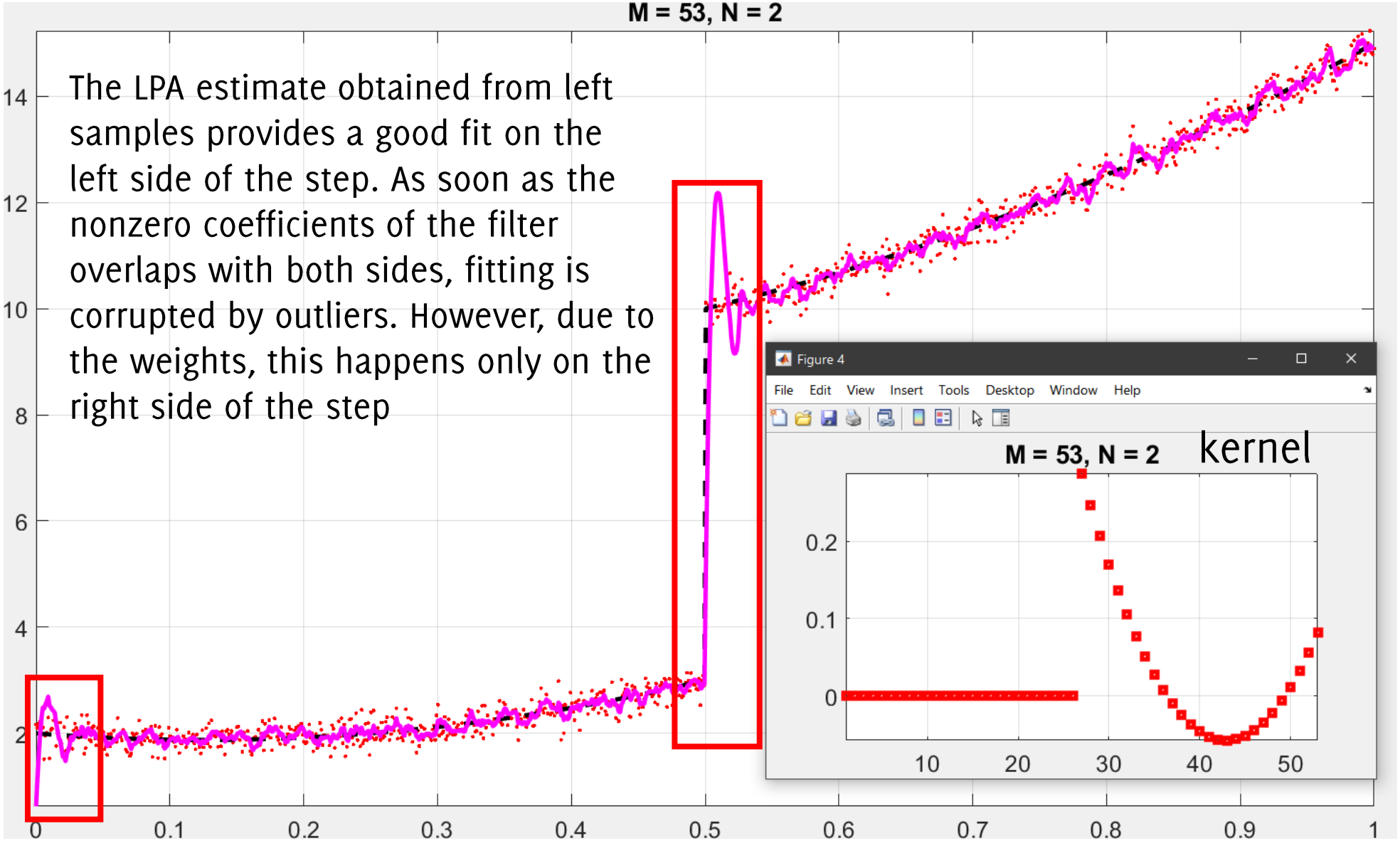


G. Boracchi

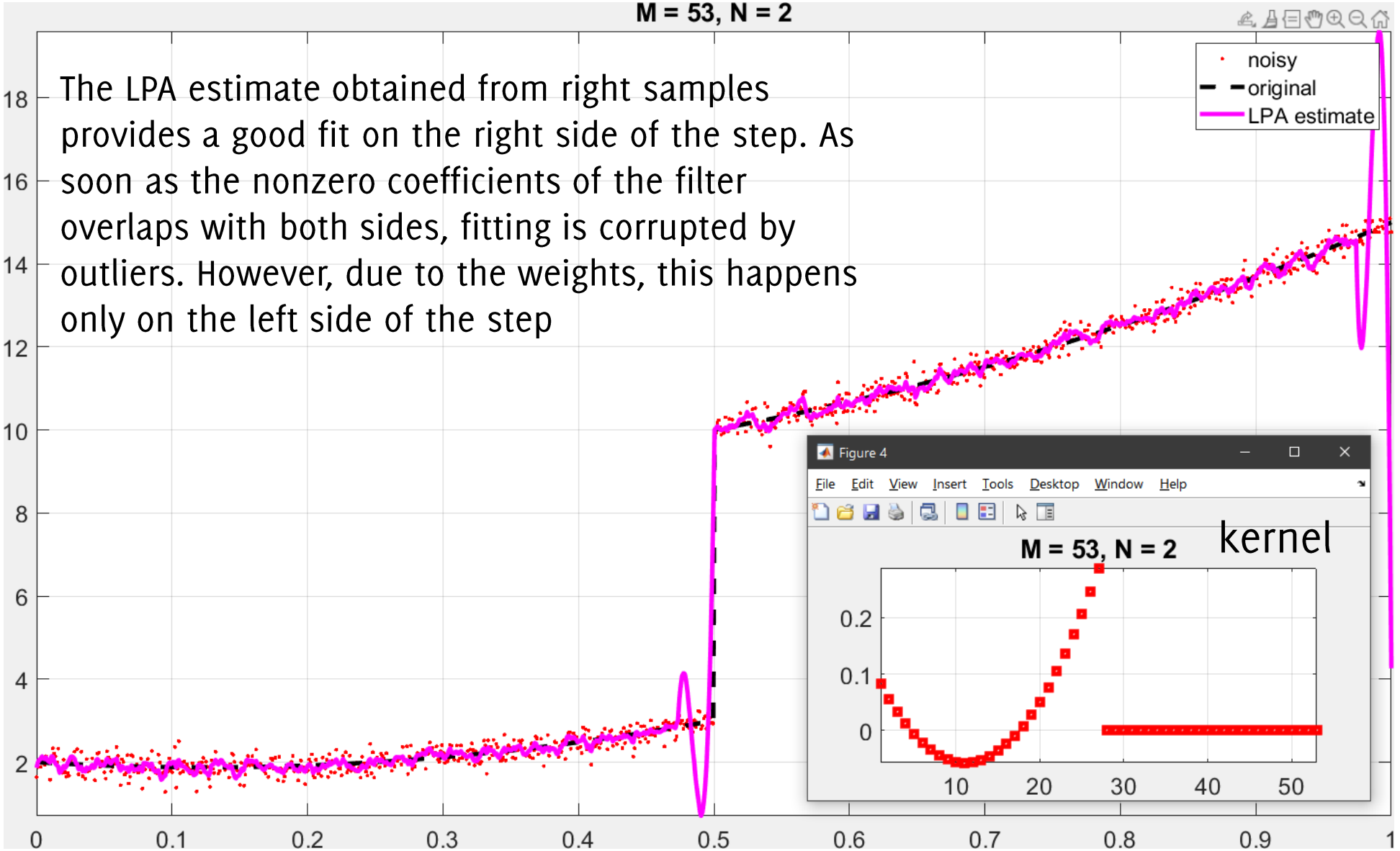
Handling Discontinuities: «left weights»



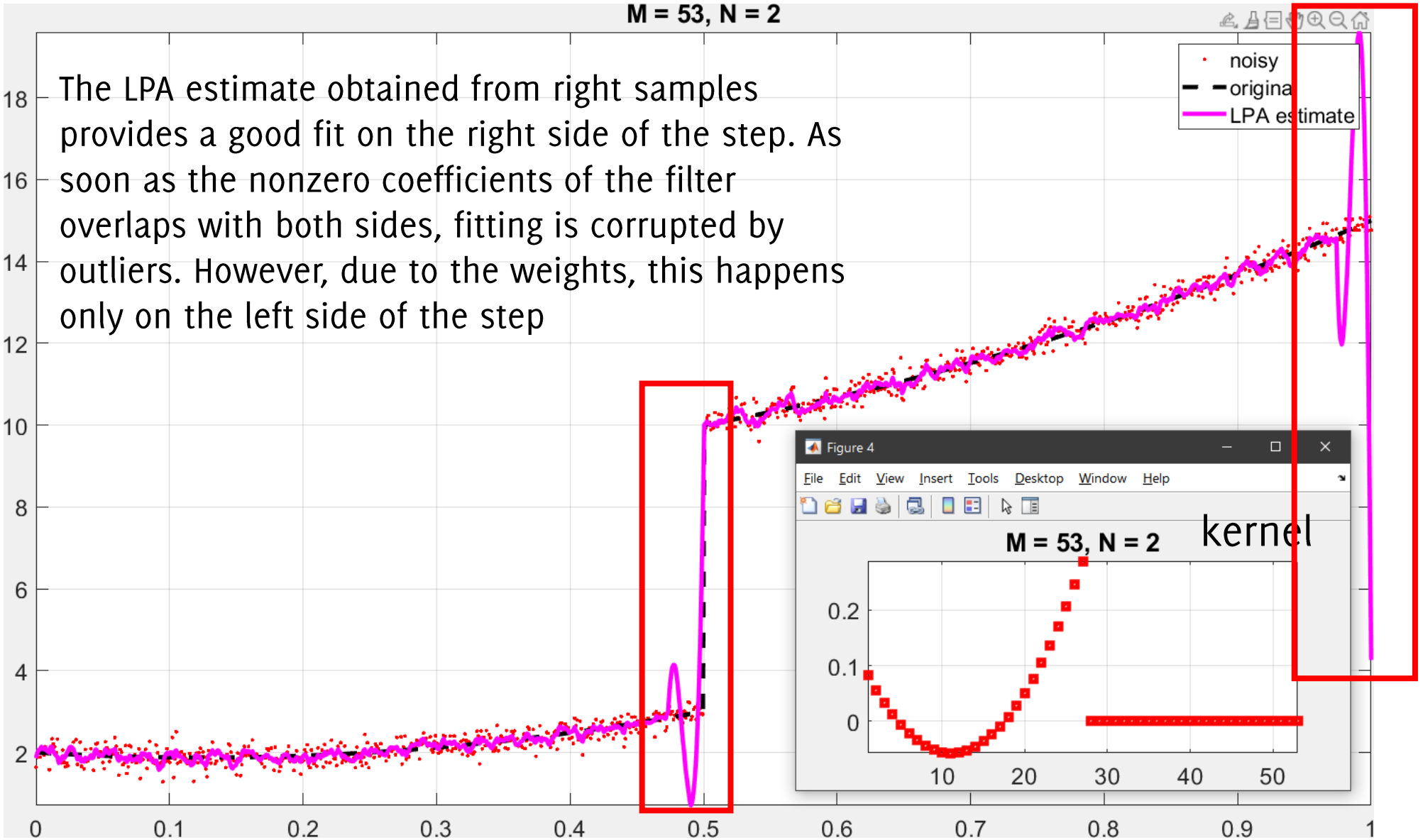
Handling Discontinuities: «left weights»



Handling Discontinuities: «right weights»

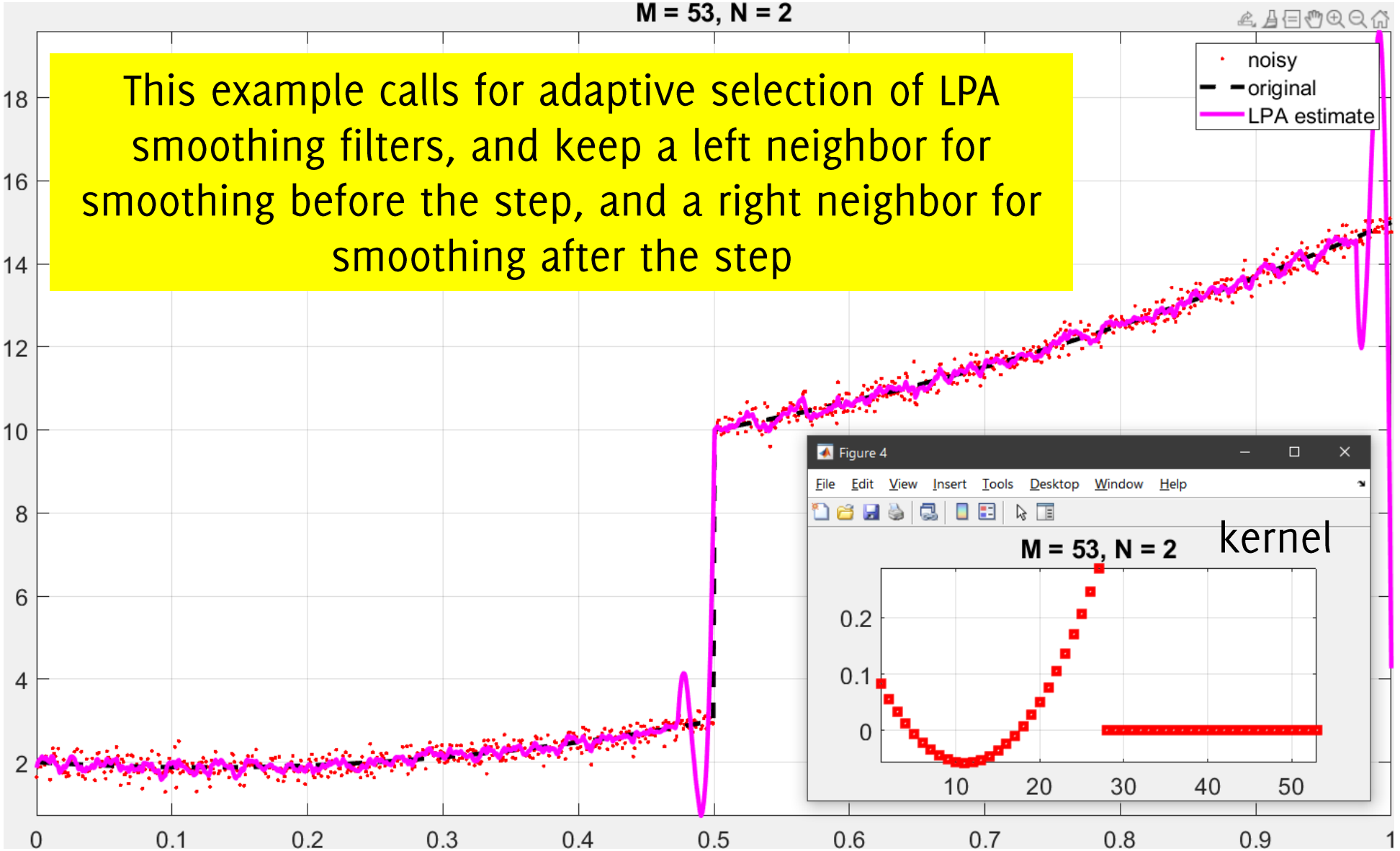


Handling Discontinuities: «right weights»



G. Boracchi

Handling Discontinuities: «right weights»



G. Boracchi