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## Identifying a piecewise affine signal from its nonlinear observation - application to DNA replication analysis

Wednesday 2 October 2024 09:50 (35 minutes)

An important challenge in DNA replication analysis is to recover a so-called timing profile, that contains important information about the replication dynamics, from nonlinear observations. We show that this challenge can be expressed as a nonlinear sparse coding inverse problem where the unknown timing profile is assumed to be piecewise affine.

We propose a novel formalism and computational approach to harness it. In the noiseless case, we establish sufficient identifiability conditions for the timing profile, and prove that it is the solution of a non-convex optimization problem.

We propose the DNA-inverse optimization method that provably finds the global solution to the nonlinear inverse problem for noisy signals. Besides being more computationally effective than the state-of-the-art optimization, our approach automatically recovers all configurations of the replication dynamics. This is crucial for DNA replication analysis, and was not possible with previous methods

### Contribution length

Middle

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