

Playing around with parameters

Optimizer

STLSQ

"Sequentially thresholded least squares"

They take the argument λ , which specifies a threshold "of sparsity". Should parameter p_i be smaller than λ , it will be removed (and its corresponding term)

Meaning that the bigger the threshold is, the **less** terms may be present in the final model. In other words, the bigger the threshold, the more terms will be removed.

For `1D-Neuron-Multiple` the value of λ seemed to be best around $(10^{-1}, 10^{-3})$, smaller values of λ included insignificant noise.

“ Default value is $\lambda = 10^{-1}$

Also for the [basic example](#) they set the value to $\lambda = 10^{-1}$, which seems to agree.

TODO: STLSQ with vector of thresholds

Metrics

L_2 Norm error

L_2 (or L_2) norm of the error gives the L_2 of an error in each dimension

Of course the smaller the better

TVDIFF

Most times around 300 iterations seems to be by far enough

Regularization α

The regularization parameter α tells us how strongly should the derivative be regularized (think of it as smoothed)

The bigger the α the less it oscillates, though the less "features" of the true derivative it really exhibits

It is mostly visible when there is a big spike in the derivative. Then the `tvdiff` is unable "to catch up" when strongly regularized doesn't handle the spike well (it simply doesn't feature nearly as big of a spike)

I'd recommend starting with a higher α and slowly increasing it, until we find the derivative smooth enough.

With small α always check if it more or less corresponds to data (it has tendency to oscillate when the function is too constant)

Epsilon ϵ

Using `tvdiff` with $\epsilon=1e-9$, we obtain a strongly regularized result. Larger values of ϵ improve conditioning and speed, while smaller values give more accurate results with sharper jumps.

Scale and preconditioner

TO BE DONE

Performance

In general the more data (and thus the derivation) varies in scale, the worse to model performs

Collocations

Data collocation is only used when derivative is NOT supplied (and is surely better than forward diff)

TODO: Usage collocations on existing derivative?

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