Each case is fitted with 6 models: (1) smoother with exact Hessian, (2) smoother with Fisher Hessian, (3) Fisher smoother with small window, (4) Fisher smoother with large window, (5) direct Laplace, Newton-Raphson (NR) with Fisher Hessian and (6) NR with exact Hessian.

# Case 2



Run time: \*NRs are initiated by pre-adaptive Fisher smoothing

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Exact Smoother- window = 1 | Fisher Smoother- window = 1 | Fisher Smoother-window = 20 | Fisher Smoother-window = 100 | NR-Fisher scoring Hessian | NR-exact Hessian |
| 0.423872 s | 0.507953 s | 1.286366 s | 3.746579 s | 2.149235 s | 1.394820 s |

Training log-likelihood per spike & MSE (the only differences between 2 NRs are just running time)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Exact Smoother- window = 1 | Fisher Smoother- window = 1 | Fisher Smoother-window = 20 | Fisher Smoother-window = 100 | NR |
| Llhd/spk | -0.2398 | -0.2389 | -0.2440 | -0.2439 | -0.2326 |
| MSE | 7.5998 | 7.3371 | 8.7116 | 8.6456 | 6.8210 |

Test log-likelihood per spike & MSE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Exact Smoother- window = 1 | Fisher Smoother- window = 1 | Fisher Smoother-window = 20 | Fisher Smoother-window = 100 | NR |
| Single set of new data | Llhd/spk | -0.2626 | -0.2509 | -0.2493 | -0.2458 | -0.2522 |
| MSE | 10.1064 | 9.5376 | 9.3424 | 8.8332 | 9.4483 |
| Mean of 500 sets of new data | Llhd/spk | -0.2612 | -0.2512 | -0.2503 | -0.2466 | -0.2517 |
| MSE | 9.7732 | 9.2789 | 9.1391 | 8.6788 | 9.1667 |

# Case 3



Run time: \*NRs are initiated by pre-adaptive Fisher smoothing

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Exact Smoother- window = 1 | Fisher Smoother- window = 1 | Fisher Smoother-window = 10 | Fisher Smoother-window = 50 | NR-Fisher scoring Hessian | NR-exact Hessian |
| 0.435019 s | 0.552154 s | 1.127127 s | 2.687056 s | 1.203469 s | 1.098722 s |

Training log-likelihood per spike & MSE (the only differences between 2 NRs are just running time)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Exact Smoother- window = 1 | Fisher Smoother- window = 1 | Fisher Smoother-window = 10 | Fisher Smoother-window = 50 | NR |
| Llhd/spk | -0.3478 | -0.3015 | -0.3036 | -0.3084 | -0.2937 |
| MSE | 6.2152 | 3.9766 | 4.5034 | 4.8317 | 3.2648 |

Test log-likelihood per spike & MSE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Exact Smoother- window = 1 | Fisher Smoother- window = 1 | Fisher Smoother-window = 10 | Fisher Smoother-window = 50 | NR |
| Single set of new data | Llhd/spk | -0.3614 | -0.3106 | -0.3124 | -0.3101 | -0.3067 |
| MSE | 7.0263 | 4.7866 | 4.9216 | 4.8994 | 4.2639 |
| Mean of 500 sets of new data | Llhd/spk | -0.3596 | -0.3102 | -0.3126 | -0.3110 | -0.3055 |
| MSE | 7.0118 | 4.8025 | 4.9387 | 4.9361 | 4.2386 |

# MATLAB coding issue

To see the problem, do the following steps (in [Newton\_demo.m](https://github.com/weigcdsb/COM_POISSON/blob/main/demo/Newton_Gibbs/Newton_demo.m)):

1. Use window = 10 for pre-adaptive smoothing: change ‘1’ to ‘10’ in line 53
2. Run the code for NR, e.g. line 101 to 110. Get stuck…
3. Pause MATLAB and quit debugging & clear all variables in the environment.
4. Undo the change of window: reset window size be 1 in line 53
5. Rerun the code… Still get stuck in NR

Therefore, I must reboot the MATLAB to run. Does that mean I just run out of RAM, and “clear all” command doesn’t free the memory? Maybe I need to add some code after each run of NR…