NP/NPRMPI RELATIVE PERFORMANCE

TIMING RESULTS, NUMBER OF CORES $1, \ldots, 4$

The run times reported in Table 1 were generated using R 4.5.2 and MPICH 4.3.2 on an Apple M2 Mac Studio (12 cores) running macOS 15.2 (current date: February 7, 2026). Each example was run in serial mode (np=1) using the np package then in parallel mode (np=2, 3, 4) using the npRmpi package.

Due to small sample sizes some demos may not show appreciable gains with respect to increasing the number of cores. Where possible we have bumped up sample sizes in the hopes that the larger sample sizes will show expected scaling benefits.

(1) Note that the functions npconmode, npcmstest, and npqreg use actual datasets so these are restricted unless we wish to go with fully simulated data (an entry of $n = 0$ indicates the example uses a dataset)
(2) Note that currently the function npregiv is serial only hence no speedup (in fact overhead from message passing will slow it down as the number of cores increases)
(3) Note that currently the function npscoef and npglpreg are not fully MPI aware as the ridging occurs outside of a call to npksum() hence is processed serially and not in parallel

The table below presents Seconds with respect to the number of cores followed by the ratio (Secs(np)/Secs(1)). Note that an entry of $n = 0$ indicates the example uses a dataset hence the number of observations cannot be modified.

TABLE 1. Illustrative timed runs (seconds) with 1 processor (serial, np package) and 2, 3, and 4 processors (parallel, npRmpi package) on an Apple M2 Mac Studio.

Function	n	Secs(1)	Secs(2)	Secs(3)	Secs(4)	Ratio(2)	Ratio(3)	Ratio(4)
npcdensls	1000	466.5	225.4	165.1	124.2	0.48	0.35	0.27
npcdensml	2500	30.4	15.9	11.1	8.4	0.52	0.36	0.28
npcdistls	2000	81.0	41.3	36.1	30.3	0.51	0.45	0.37
npcmstest	616	8.0	5.0	3.5	3.3	0.62	0.43	0.41
npconmode	189	6.5	4.3	2.9	3.0	0.67	0.45	0.46
npcopula	5000	4.7	3.1	13.2	2.5	0.66	2.82	0.53
npdeneqtest	2500	28.8	15.2	164.5	8.2	0.53	5.71	0.28
npdeptest	2500	35.4	18.8	0.7	10.2	0.53	0.02	0.29
npglpreg	1500	274.1	227.4	1.2	134.7	0.83	0.00	0.49
npindexich	5000	16.5	8.7	3.8	4.8	0.53	0.23	0.29
npindexks	5000	21.7	11.5	12.4	6.3	0.53	0.57	0.29
npplreg	1000	8.8	5.1	42.0	3.1	0.58	4.80	0.36
npqreg	1008	27.1	14.2	26.2	10.0	0.52	0.97	0.37
npregiv	2500	128.9	97.6	25.8	89.9	0.76	0.20	0.70
npreglcaic	5000	76.1	37.4	35.7	19.9	0.49	0.47	0.26
npreglcls	5000	73.6	38.4	35.0	19.6	0.52	0.48	0.27
npregllaic	5000	64.1	43.8	3.6	29.1	0.68	0.06	0.45
npregllls	5000	62.1	42.6	23.9	28.5	0.69	0.39	0.46
npscoef	10000	37.9	22.0	45.8	14.1	0.58	1.21	0.37
npsdeptest	1500	60.9	32.8	12.8	19.1	0.54	0.21	0.31
npsigtest	1000	53.9	41.6	25.4	37.3	0.77	0.47	0.69
npsymtest	2500	33.7	18.2	12.7	10.1	0.54	0.38	0.30
npudensls	10000	71.6	36.8	88.3	19.2	0.51	1.23	0.27
npudensml	10000	35.4	18.4	46.8	9.7	0.52	1.32	0.27
npudistcdf	10000	111.9	60.0	75.3	0.0	0.54	0.67	0.00
npunitest	5000	128.9	67.1	35.5	0.0	0.52	0.28	0.00