

| Using | [Matrix] | Time / mpi | Inf Norm / mpi | Time / dgemm | Inf Norm / dgemm | Time / manual | Inf Norm / manual |
|---------------------|----------|------------|----------------|--------------|------------------|---------------|-------------------|
| ./A4-mpi-1D-cblas-r | 50 | 0.003623 | 89,502.0 | 0.000283 | 89,502.0 | 0.001390 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003733 | 89,502.0 | 0.000285 | 89,502.0 | 0.001273 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003172 | 89,502.0 | 0.000282 | 89,502.0 | 0.001216 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003412 | 89,502.0 | 0.000290 | 89,502.0 | 0.001217 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003678 | 89,502.0 | 0.000287 | 89,502.0 | 0.001214 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003299 | 89,502.0 | 0.000295 | 89,502.0 | 0.001214 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018782 | 353,266.0 | 0.002029 | 353,266.0 | 0.009716 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018608 | 353,266.0 | 0.002060 | 353,266.0 | 0.009452 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.017310 | 353,266.0 | 0.002612 | 353,266.0 | 0.009707 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018808 | 353,266.0 | 0.002283 | 353,266.0 | 0.010504 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.020819 | 353,266.0 | 0.002188 | 353,266.0 | 0.010953 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.029216 | 353,266.0 | 0.002254 | 353,266.0 | 0.020780 | 353,266.0 |

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|---------------------|-----|----------|-----------|----------|-----------|----------|-----------|
| ./A4-mpi-1D-cblas-r | 50 | 0.003392 | 89,502.0 | 0.000284 | 89,502.0 | 0.001266 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003450 | 89,502.0 | 0.000285 | 89,502.0 | 0.001228 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003227 | 89,502.0 | 0.000289 | 89,502.0 | 0.001234 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003526 | 89,502.0 | 0.000286 | 89,502.0 | 0.001235 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003154 | 89,502.0 | 0.000286 | 89,502.0 | 0.001231 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003247 | 89,502.0 | 0.000293 | 89,502.0 | 0.001258 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.017802 | 353,266.0 | 0.002062 | 353,266.0 | 0.009515 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018403 | 353,266.0 | 0.002130 | 353,266.0 | 0.009852 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.019895 | 353,266.0 | 0.002405 | 353,266.0 | 0.010686 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.019114 | 353,266.0 | 0.002475 | 353,266.0 | 0.010289 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.019182 | 353,266.0 | 0.002044 | 353,266.0 | 0.009500 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.017434 | 353,266.0 | 0.002044 | 353,266.0 | 0.010240 | 353,266.0 |

| | [Matrix] | Time / mpi | Inf Norm / mpi | Time / dgemm | Inf Norm / dgemm | Time / manual | Inf Norm / manual |
|---------------------|----------|------------|----------------|--------------|------------------|---------------|-------------------|
| ./A4-mpi-1D-cblas-i | 50 | 0.003602 | 1,625,625.0 | 0.000284 | 1,625,625.0 | 0.001235 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003732 | 1,625,625.0 | 0.000292 | 1,625,625.0 | 0.001267 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003618 | 1,625,625.0 | 0.000298 | 1,625,625.0 | 0.001206 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003685 | 1,625,625.0 | 0.000284 | 1,625,625.0 | 0.001413 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003320 | 1,625,625.0 | 0.000291 | 1,625,625.0 | 0.001307 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003635 | 1,625,625.0 | 0.000306 | 1,625,625.0 | 0.001214 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019787 | 25,502,500.0 | 0.002165 | 25,502,500.0 | 0.009916 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019724 | 25,502,500.0 | 0.002610 | 25,502,500.0 | 0.009465 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018439 | 25,502,500.0 | 0.002037 | 25,502,500.0 | 0.009821 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018494 | 25,502,500.0 | 0.002125 | 25,502,500.0 | 0.010103 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018573 | 25,502,500.0 | 0.002042 | 25,502,500.0 | 0.009436 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018571 | 25,502,500.0 | 0.002355 | 25,502,500.0 | 0.009768 | 25,502,500.0 |

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|---------------------|-----|----------|--------------|----------|--------------|----------|--------------|
| ./A4-mpi-1D-cblas-i | 50 | 0.003495 | 1,625,625.0 | 0.000288 | 1,625,625.0 | 0.001215 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003394 | 1,625,625.0 | 0.000284 | 1,625,625.0 | 0.001221 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003525 | 1,625,625.0 | 0.000289 | 1,625,625.0 | 0.001229 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003378 | 1,625,625.0 | 0.000280 | 1,625,625.0 | 0.001226 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003452 | 1,625,625.0 | 0.000284 | 1,625,625.0 | 0.001432 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003316 | 1,625,625.0 | 0.000289 | 1,625,625.0 | 0.001217 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018835 | 25,502,500.0 | 0.002032 | 25,502,500.0 | 0.009974 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019427 | 25,502,500.0 | 0.002039 | 25,502,500.0 | 0.009459 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018434 | 25,502,500.0 | 0.002067 | 25,502,500.0 | 0.009416 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019503 | 25,502,500.0 | 0.002044 | 25,502,500.0 | 0.009552 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019931 | 25,502,500.0 | 0.002032 | 25,502,500.0 | 0.009669 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018945 | 25,502,500.0 | 0.002147 | 25,502,500.0 | 0.009493 | 25,502,500.0 |

| | [Matrix] | Time / mpi | Inf Norm / mpi | Time / dgemm | Inf Norm / dgemm | Time / manual | Inf Norm / manual |
|---------------------|----------|------------|-------------------|--------------|-------------------|---------------|-------------------|
| ./A4-mpi-1D-cblas-r | 50 | 0.003295 | 89,502.0 | 0.000282 | 89,502.0 | 0.001214 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003377 | 89,502.0 | 0.000293 | 89,502.0 | 0.001245 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003426 | 89,502.0 | 0.000289 | 89,502.0 | 0.001233 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018321 | 353,266.0 | 0.002047 | 353,266.0 | 0.009422 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.023710 | 353,266.0 | 0.002265 | 353,266.0 | 0.009528 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018545 | 353,266.0 | 0.002035 | 353,266.0 | 0.009973 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.974433 | 8,117,937.0 | 0.852176 | 8,117,937.0 | 3.526722 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.781977 | 8,117,937.0 | 0.901864 | 8,117,937.0 | 3.478443 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.660107 | 8,117,937.0 | 0.813615 | 8,117,937.0 | 3.387792 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.669998 | 8,117,937.0 | 0.826524 | 8,117,937.0 | 3.432746 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 25.021923 | 31,896,067.0 | 6.877664 | 31,896,067.0 | 23.402237 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 25.668985 | 31,896,067.0 | 6.845725 | 31,896,067.0 | 24.111009 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 25.339146 | 31,896,067.0 | 7.069291 | 31,896,067.0 | 24.148800 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 25.378952 | 31,896,067.0 | 6.827083 | 31,896,067.0 | 24.631762 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003793 | 89,502.0 | 0.000300 | 89,502.0 | 0.001219 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003746 | 89,502.0 | 0.000614 | 89,502.0 | 0.001306 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 50 | 0.003574 | 89,502.0 | 0.000284 | 89,502.0 | 0.001208 | 89,502.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.019365 | 353,266.0 | 0.002036 | 353,266.0 | 0.009537 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.022317 | 353,266.0 | 0.002033 | 353,266.0 | 0.009473 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 100 | 0.018096 | 353,266.0 | 0.002620 | 353,266.0 | 0.015792 | 353,266.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.794989 | 8,117,937.0 | 0.823255 | 8,117,937.0 | 4.208720 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.594502 | 8,117,937.0 | 0.872222 | 8,117,937.0 | 3.590184 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.834893 | 8,117,937.0 | 0.837537 | 8,117,937.0 | 3.589217 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 500 | 3.588232 | 8,117,937.0 | 0.815256 | 8,117,937.0 | 3.826735 | 8,117,937.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 23.135391 | 31,896,067.0 | 6.489187 | 31,896,067.0 | 22.191726 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 23.256875 | 31,896,067.0 | 6.380877 | 31,896,067.0 | 22.198515 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 23.812851 | 31,896,067.0 | 6.490945 | 31,896,067.0 | 22.314222 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-r | 1000 | 23.409070 | 31,896,067.0 | 6.580239 | 31,896,067.0 | 22.907298 | 31,896,067.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003397 | 1,625,625.0 | 0.000288 | 1,625,625.0 | 0.001242 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003611 | 1,625,625.0 | 0.000287 | 1,625,625.0 | 0.001215 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003682 | 1,625,625.0 | 0.000288 | 1,625,625.0 | 0.001211 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019267 | 25,502,500.0 | 0.002433 | 25,502,500.0 | 0.009435 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018404 | 25,502,500.0 | 0.002047 | 25,502,500.0 | 0.009442 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.023596 | 25,502,500.0 | 0.002019 | 25,502,500.0 | 0.012373 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.669566 | 15,687,562,500.0 | 0.818055 | 15,687,562,500.0 | 3.356318 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.575005 | 15,687,562,500.0 | 0.821899 | 15,687,562,500.0 | 3.329264 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.580136 | 15,687,562,500.0 | 0.827713 | 15,687,562,500.0 | 3.289661 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.638119 | 15,687,562,500.0 | 0.810202 | 15,687,562,500.0 | 3.298383 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 23.389160 | 250,500,250,000.0 | 6.553018 | 250,500,250,000.0 | 23.616626 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 23.609556 | 250,500,250,000.0 | 6.560736 | 250,500,250,000.0 | 22.512074 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 23.316519 | 250,500,250,000.0 | 6.552578 | 250,500,250,000.0 | 22.917504 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 23.223686 | 250,500,250,000.0 | 6.693635 | 250,500,250,000.0 | 22.248374 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.004897 | 1,625,625.0 | 0.000281 | 1,625,625.0 | 0.001219 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003326 | 1,625,625.0 | 0.001049 | 1,625,625.0 | 0.002203 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 50 | 0.003305 | 1,625,625.0 | 0.000286 | 1,625,625.0 | 0.001210 | 1,625,625.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018313 | 25,502,500.0 | 0.002023 | 25,502,500.0 | 0.009471 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.018587 | 25,502,500.0 | 0.002033 | 25,502,500.0 | 0.009530 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 100 | 0.019000 | 25,502,500.0 | 0.002073 | 25,502,500.0 | 0.009658 | 25,502,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.710844 | 15,687,562,500.0 | 0.834674 | 15,687,562,500.0 | 3.355016 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.587707 | 15,687,562,500.0 | 0.819234 | 15,687,562,500.0 | 3.319822 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.619530 | 15,687,562,500.0 | 0.816740 | 15,687,562,500.0 | 3.347187 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 500 | 3.604923 | 15,687,562,500.0 | 0.818356 | 15,687,562,500.0 | 3.359344 | 15,687,562,500.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 23.619057 | 250,500,250,000.0 | 6.392954 | 250,500,250,000.0 | 21.995911 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 24.271146 | 250,500,250,000.0 | 6.441605 | 250,500,250,000.0 | 22.635459 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 23.330612 | 250,500,250,000.0 | 6.564853 | 250,500,250,000.0 | 22.277569 | 250,500,250,000.0 |
| ./A4-mpi-1D-cblas-i | 1000 | 22.908853 | 250,500,250,000.0 | 6.467756 | 250,500,250,000.0 | 22.457247 | 250,500,250,000.0 |

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