

1 Test matrices

Low-dimensional ($n \approx 2^{11}$)

| Matrix | Patt. symm. | Num. symm. | Diag. dom. | Pos. def. | NNZ | n | Condition | Conn. comp. |
|----------------------------|-------------|------------|------------|-----------|--------|-------|--------------|-------------|
| <i>add20</i> | 100% | 52.7% | No | No | 13,151 | 2,395 | 1.204710e+04 | 1 |
| <i>c-20</i> | 100% | 100% | No | No | 20,445 | 2,921 | 1.049837e+12 | 1 |
| <i>cryg2500</i> | 99.5% | 0% | No | No | 12,349 | 2,500 | 3.631392e+16 | 1 |
| <i>dw2048</i> | 98.5% | 94.8% | No | No | 10,114 | 2,048 | 2.093210e+03 | 1 |
| <i>orsreg_1</i> | 100% | 41.2% | Yes | No | 14,133 | 2,204 | 6.745269e+03 | 1 |
| <i>pde2961</i> | 100% | 50.1% | No | No | 14,585 | 2,961 | 6.424933e+02 | 1 |
| <i>wang1</i> | 100% | 80.8% | No | No | 19,093 | 2,903 | 2.032301e+04 | 1 |
| ex28 ¹ | 100% | 98.8% | No | No | 77,031 | 2,603 | 1.983028e+05 | 1 |
| gre512 ² | 0% | 0% | No | No | 1,976 | 512 | 1.58318e+02 | 1 |
| S40PI ³ | 100% | 2.3% | No | No | 5,341 | 2,182 | 3.851536e+18 | 1 |

Medium-dimensional ($n \approx 2^{14}$)

| Matrix | Patt. symm. | Num. symm. | Diag. dom. | Pos. def. | NNZ | n | Condition | Conn. comp. |
|---------------|-------------|------------|------------|-----------|---------|--------|--------------|-------------|
| tandem_vtx | 100% | 100% | | no | 253,350 | 18,454 | 1.676572e+05 | 1 |
| bccstk25 | | | | | | | | |
| vibrobox | | | | | | | | |
| ex19 | | | | | | | | |
| memplus | | | | | | | | |
| poisson3da | | | | | | | | |
| skirt | | | | | | | | |
| barth5 | | | | | | | | |

¹Explicit zeros. Preconditioners are singular, except for iLU(0).

²Explicit zeros. Preconditioners are singular, except for iLU(0).

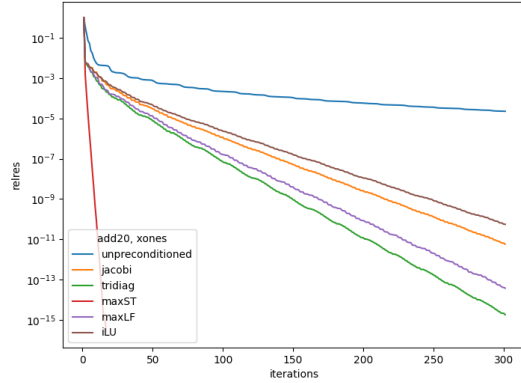
³Preconditioners are singular.

2 S coverage, degree⁴

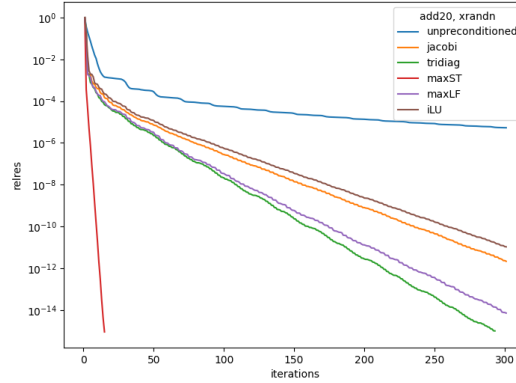
| Matrix | jacobi | tridiag | maxLF | maxST | minST |
|-----------------|--------|---------|--------|--------|--------|
| <i>add20</i> | 0.5686 | 0.5698 | 0.9496 | 0.9997 | 0.6480 |
| <i>c-20</i> | 0.9994 | 0.9994 | 0.9996 | 0.9998 | 0.9996 |
| <i>cryg2500</i> | 0.5038 | 0.8796 | 0.9040 | 0.9064 | 0.5744 |
| <i>dw2048</i> | 0.5808 | 0.9140 | 0.9423 | 0.9437 | 0.6371 |
| <i>orsreg_1</i> | 0.5001 | 0.5003 | 0.9949 | 0.9954 | 0.5017 |
| <i>pde2961</i> | 0.5027 | 0.6310 | 0.8730 | 0.8742 | 0.6370 |
| <i>wang1</i> | 0.5008 | 0.7422 | 0.8795 | 0.8905 | 0.5316 |
| <i>ex28</i> | 0.3236 | 0.3311 | 0.6349 | 0.6588 | 0.3239 |
| <i>gre512</i> | 0.1797 | 0.1816 | 0.4165 | 0.4292 | 0.4292 |
| <i>S40PI</i> | 0.0486 | 0.9231 | 0.0703 | 0.0703 | 0.0703 |

| Matrix | orig | jacobi | tridiag | maxLF | maxST | minST |
|-----------------|------|--------|---------|-------|-------|-------|
| <i>add20</i> | 83 | 0 | 2 | 2 | 11 | 27 |
| <i>c-20</i> | 157 | | | | 148 | 40 |
| <i>cryg2500</i> | 4 | | | | 3 | 4 |
| <i>dw2048</i> | 7 | | | | 5 | 4 |
| <i>orsreg_1</i> | 6 | | | | 3 | 4 |
| <i>pde2961</i> | 4 | | | | 3 | 3 |
| <i>wang1</i> | 6 | | | | 5 | 6 |
| <i>ex28</i> | 61 | | | | 5 | 7 |
| <i>gre512</i> | 4 | | | | 2 | 2 |
| <i>S40PI</i> | 6 | | | | 2 | 2 |

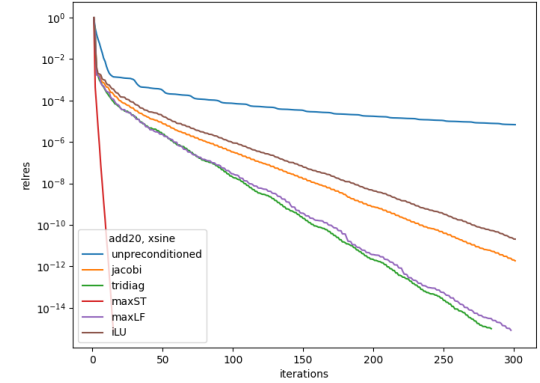
3 Results



(a) $x = 1$



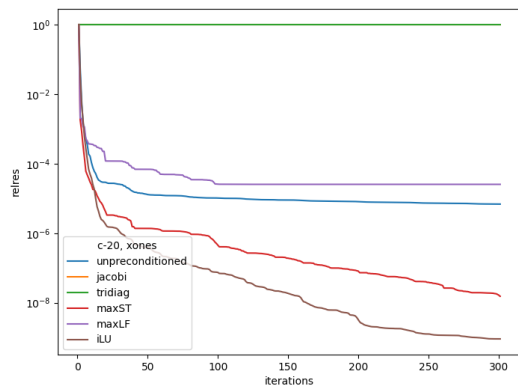
(b) $x \sim \mathcal{N}(0, 1)$



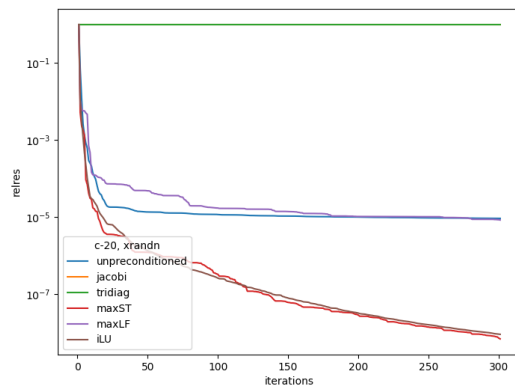
(c) $x = \sin([0, 100\pi])$

Figure 1: *add20*

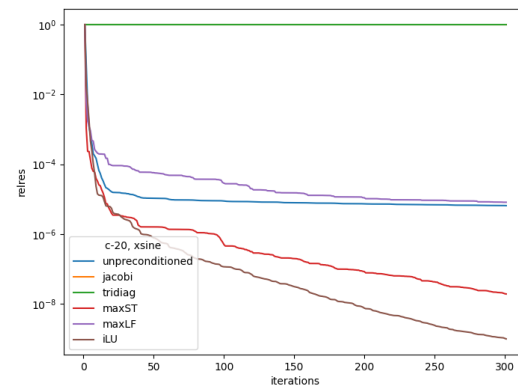
⁴ S degree $:= \max_{i \in [n]} |\{j \mid A_{ij} \neq 0\}| - 1$



(a) $x = 1$

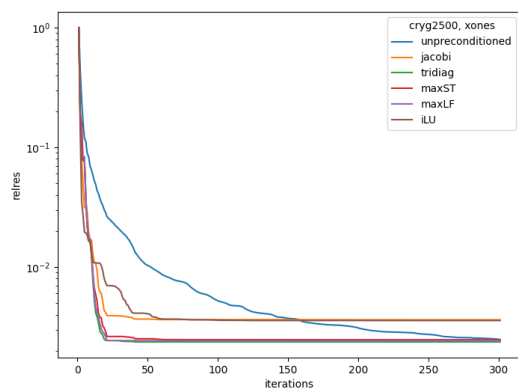


(b) $x \sim \mathcal{N}(0, 1)$

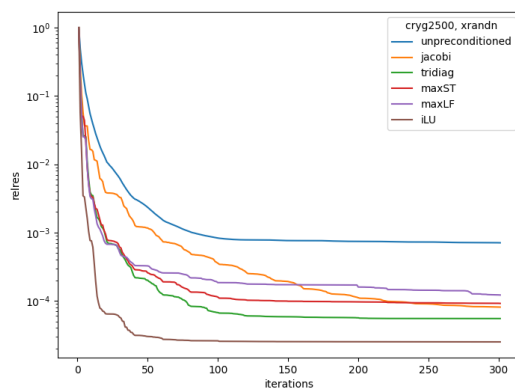


(c) $x = \sin([0, 100\pi])$

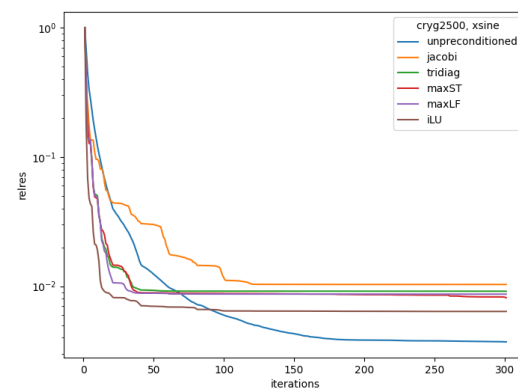
Figure 2: c-20



(a) $x = 1$

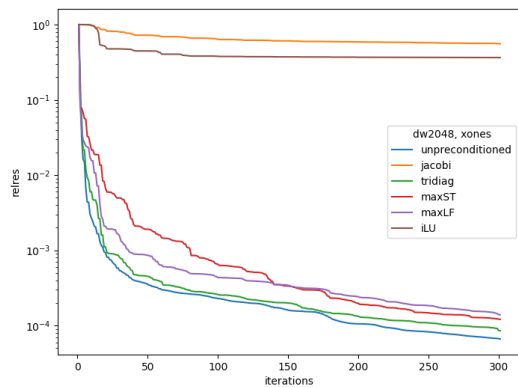


(b) $x \sim \mathcal{N}(0, 1)$

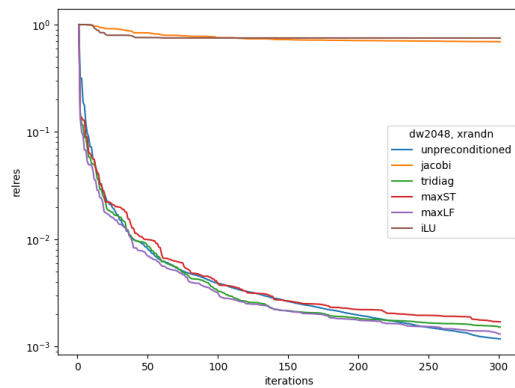


(c) $x = \sin([0, 100\pi])$

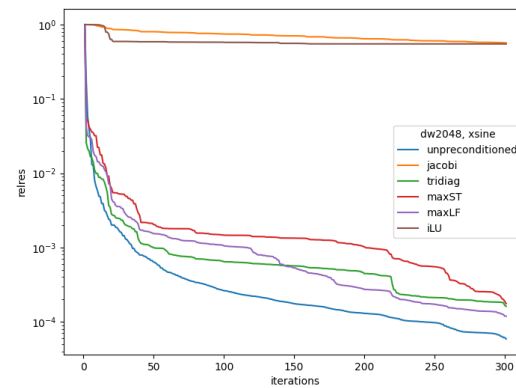
Figure 3: cryg2500



(a) $x = 1$

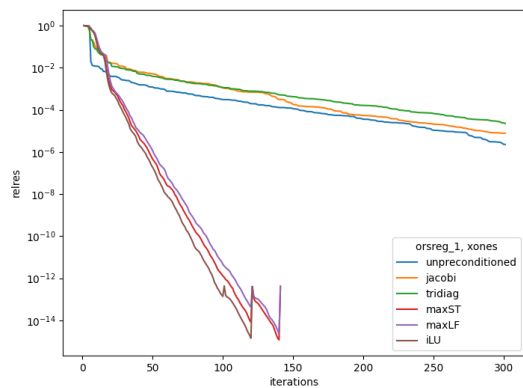


(b) $x \sim \mathcal{N}(0, 1)$

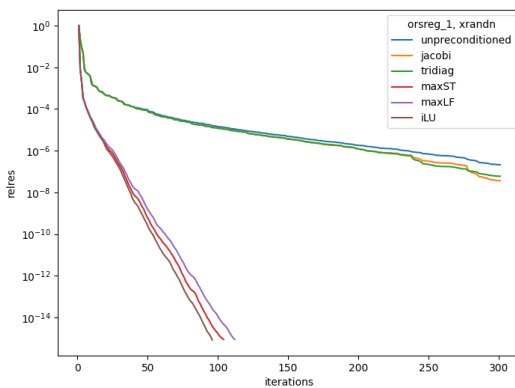


(c) $x = \sin([0, 100\pi])$

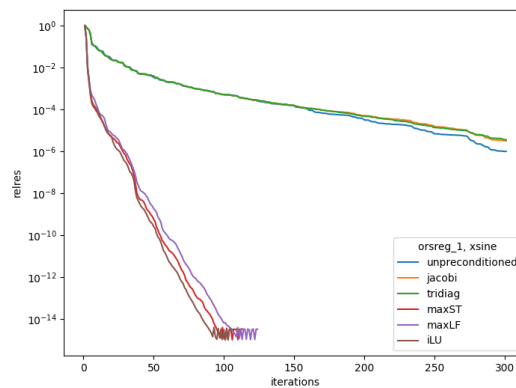
Figure 4: dw2048



(a) $x = 1$

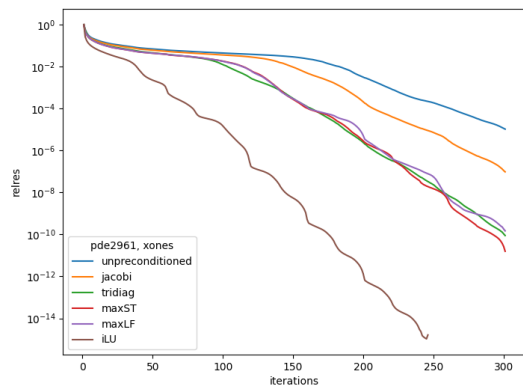


(b) $x \sim \mathcal{N}(0, 1)$

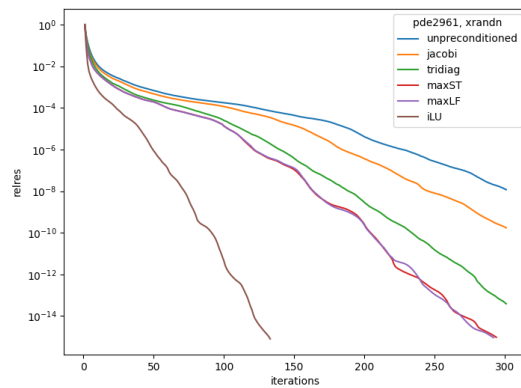


(c) $x = \sin([0, 100\pi])$

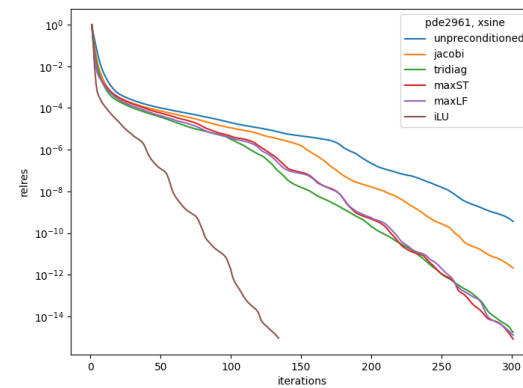
Figure 5: orsreg_1



(a) $x = 1$

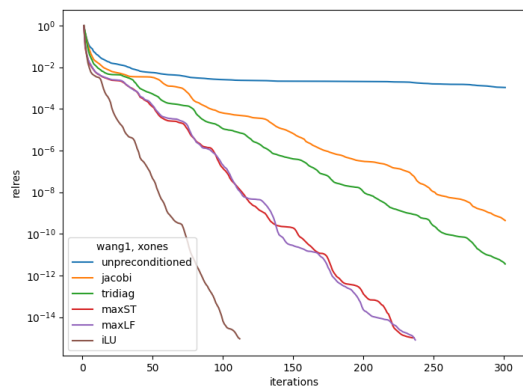


(b) $x \sim \mathcal{N}(0, 1)$

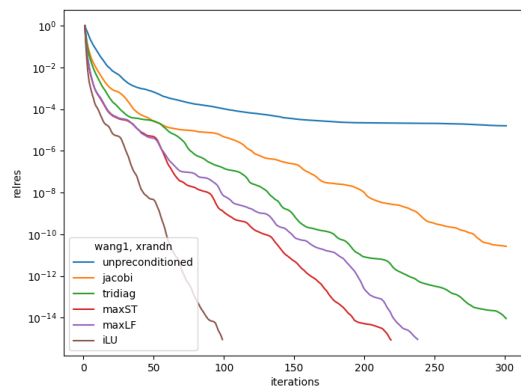


(c) $x = \sin([0, 100\pi])$

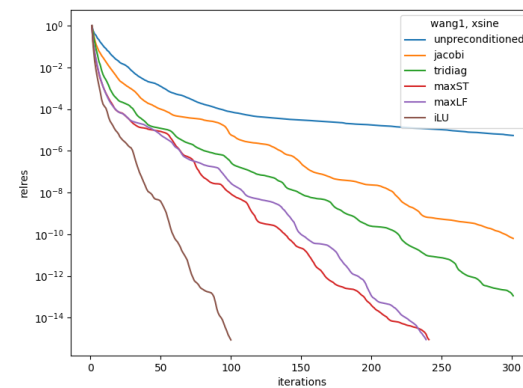
Figure 6: pde2961



(a) $x = 1$



(b) $x \sim \mathcal{N}(0, 1)$



(c) $x = \sin([0, 100\pi])$

Figure 7: wang1