

Bound constraints problems - Tables

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|----------------|----------|
| SPG | 12.0 ± 0.0 | 0.0069 ± 0.0009 | 13.0 ± 0.0 | 0 |
| PGMM | 6.0 ± 0.0 | 0.0043 ± 0.0006 | 22.0 ± 0.0 | 0 |

Table 1: Results for problem BDEXP

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-------------------|----------------------|-------------------|----------|
| SPG | 36065.0 ± 0.0 | 12.4065 ± 0.0973 | 54416.0 ± 0.0 | 0 |
| PGMM | 5798.0 ± 0.0 | 2.5526 ± 0.0108 | 23190.0 ± 0.0 | 0 |

Table 2: Results for problem BIGGSB1

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 24.0 ± 0.0 | 0.0043 ± 0.0005 | 37.0 ± 0.0 | 0 |
| PGMM | 29.0 ± 0.0 | 0.0051 ± 0.0003 | 125.0 ± 0.0 | 0 |

Table 3: Results for problem BQPGABIM

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 33.0 ± 0.0 | 0.0056 ± 0.0008 | 46.0 ± 0.0 | 0 |
| PGMM | 23.0 ± 0.0 | 0.0039 ± 0.0004 | 101.0 ± 0.0 | 0 |

Table 4: Results for problem BQPGASIM

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-------------------|----------------------|--------------------|----------|
| SPG | 61706.0 ± 0.0 | 16.4127 ± 0.0401 | 107719.0 ± 0.0 | 10 |
| PGMM | 8448.0 ± 0.0 | 2.7567 ± 0.0270 | 33803.0 ± 0.0 | 10 |

Table 5: Results for problem BQPGAUSS

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|------------------|----------------------|-------------------|----------|
| SPG | 8280.0 ± 0.0 | 14.0130 ± 0.0823 | 14049.0 ± 0.0 | 10 |
| PGMM | 1698.0 ± 0.0 | 4.4475 ± 0.0186 | 6798.0 ± 0.0 | 0 |

Table 6: Results for problem CHEBYQAD

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|------------------|---------------------|-------------------|----------|
| SPG | 4318.0 ± 0.0 | 1.6267 ± 0.0546 | 7168.0 ± 0.0 | 0 |
| PGMM | 2661.0 ± 0.0 | 1.2932 ± 0.0116 | 10642.0 ± 0.0 | 0 |

Table 7: Results for problem CHENHARK

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|---------------|----------|
| SPG | 1.0 ± 0.0 | 0.0017 ± 0.0020 | 2.0 ± 0.0 | 0 |
| PGMM | 1.0 ± 0.0 | 0.0011 ± 0.0001 | 2.0 ± 0.0 | 0 |

Table 8: Results for problem CVXBQP1

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|------------------|---------------------|------------------|----------|
| SPG | 1494.0 ± 0.0 | 0.2251 ± 0.0095 | 2295.0 ± 0.0 | 0 |
| PGMM | 217.0 ± 0.0 | 0.0354 ± 0.0013 | 866.0 ± 0.0 | 0 |

Table 9: Results for problem DECONVB

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 270.0 ± 0.0 | 0.0456 ± 0.0036 | 333.0 ± 0.0 | 0 |
| PGMM | 126.0 ± 0.0 | 0.0225 ± 0.0013 | 512.0 ± 0.0 | 10 |

Table 10: Results for problem EXPLIN

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 278.0 ± 0.0 | 0.0481 ± 0.0042 | 420.0 ± 0.0 | 0 |
| PGMM | 83.0 ± 0.0 | 0.0149 ± 0.0008 | 331.0 ± 0.0 | 10 |

Table 11: Results for problem EXPLIN2

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|------------------|----------|
| SPG | 757.0 ± 0.0 | 0.1291 ± 0.0050 | 1171.0 ± 0.0 | 10 |
| PGMM | 79.0 ± 0.0 | 0.0150 ± 0.0001 | 319.0 ± 0.0 | 10 |

Table 12: Results for problem EXPQUAD

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 20.0 ± 0.0 | 0.0050 ± 0.0006 | 27.0 ± 0.0 | 0 |
| PGMM | 29.0 ± 0.0 | 0.0082 ± 0.0004 | 115.0 ± 0.0 | 0 |

Table 13: Results for problem HADAMALS

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 126.0 ± 0.0 | 0.1962 ± 0.0042 | 189.0 ± 0.0 | 0 |
| PGMM | 22.0 ± 0.0 | 0.0515 ± 0.0015 | 86.0 ± 0.0 | 0 |

Table 14: Results for problem HARKERP2

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|----------------|----------|
| SPG | 7.0 ± 0.0 | 0.0012 ± 0.0001 | 9.0 ± 0.0 | 0 |
| PGMM | 5.0 ± 0.0 | 0.0010 ± 0.0001 | 19.0 ± 0.0 | 0 |

Table 15: Results for problem HS110

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|----------------|----------|
| SPG | 5.0 ± 0.0 | 0.0010 ± 0.0002 | 7.0 ± 0.0 | 0 |
| PGMM | 3.0 ± 0.0 | 0.0009 ± 0.0001 | 11.0 ± 0.0 | 0 |

Table 16: Results for problem JNLBRNG1

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|------------------|---------------------|------------------|----------|
| SPG | 1016.0 ± 0.0 | 1.0989 ± 0.0107 | 1590.0 ± 0.0 | 0 |
| PGMM | 479.0 ± 0.0 | 0.7364 ± 0.0058 | 1914.0 ± 0.0 | 0 |

Table 17: Results for problem JNLBRNG2

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|------------------|----------|
| SPG | 660.0 ± 0.0 | 0.6244 ± 0.0096 | 1057.0 ± 0.0 | 0 |
| PGMM | 291.0 ± 0.0 | 0.3785 ± 0.0065 | 1163.0 ± 0.0 | 0 |

Table 18: Results for problem JNLBRNGA

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-------------------|----------------------|-------------------|----------|
| SPG | 10680.0 ± 0.0 | 10.1044 ± 0.0502 | 17627.0 ± 0.0 | 0 |
| PGMM | 1324.0 ± 0.0 | 1.7310 ± 0.0302 | 5295.0 ± 0.0 | 0 |

Table 19: Results for problem JNLBRNGB

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|------------------|---------------------|------------------|----------|
| SPG | 1078.0 ± 0.0 | 0.3483 ± 0.0075 | 1772.0 ± 0.0 | 0 |
| PGMM | 412.0 ± 0.0 | 0.1728 ± 0.0086 | 1646.0 ± 0.0 | 0 |

Table 20: Results for problem LINVERSE

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|----------------|----------|
| SPG | 15.0 ± 0.0 | 0.0098 ± 0.0008 | 16.0 ± 0.0 | 0 |
| PGMM | 13.0 ± 0.0 | 0.0108 ± 0.0003 | 50.0 ± 0.0 | 0 |

Table 21: Results for problem MCCORMCK

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|---------------|----------|
| SPG | 1.0 ± 0.0 | 0.0018 ± 0.0022 | 2.0 ± 0.0 | 0 |
| PGMM | 1.0 ± 0.0 | 0.0010 ± 0.0001 | 2.0 ± 0.0 | 0 |

Table 22: Results for problem NCVXBQP1

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 76.0 ± 0.0 | 0.0435 ± 0.0041 | 83.0 ± 0.0 | 10 |
| PGMM | 40.0 ± 0.0 | 0.0335 ± 0.0016 | 176.0 ± 0.0 | 10 |

Table 23: Results for problem NCVXBQP2

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 107.0 ± 0.0 | 0.0561 ± 0.0026 | 113.0 ± 0.0 | 10 |
| PGMM | 62.0 ± 0.0 | 0.0497 ± 0.0017 | 259.0 ± 0.0 | 10 |

Table 24: Results for problem NCVXBQP3

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 236.0 ± 0.0 | 0.1452 ± 0.0105 | 350.0 ± 0.0 | 0 |
| PGMM | 147.0 ± 0.0 | 0.1200 ± 0.0057 | 592.0 ± 0.0 | 0 |

Table 25: Results for problem NOBNDTOR

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 41.0 ± 0.0 | 0.0173 ± 0.0015 | 42.0 ± 0.0 | 0 |
| PGMM | 28.0 ± 0.0 | 0.0144 ± 0.0002 | 110.0 ± 0.0 | 0 |

Table 26: Results for problem NONSCOMP

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 404.0 ± 0.0 | 0.3846 ± 0.0098 | 572.0 ± 0.0 | 0 |
| PGMM | 192.0 ± 0.0 | 0.2564 ± 0.0078 | 766.0 ± 0.0 | 0 |

Table 27: Results for problem OBSTCLAE

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 210.0 ± 0.0 | 0.2023 ± 0.0092 | 280.0 ± 0.0 | 0 |
| PGMM | 87.0 ± 0.0 | 0.1163 ± 0.0014 | 349.0 ± 0.0 | 0 |

Table 28: Results for problem OBSTCLAL

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 241.0 ± 0.0 | 0.2258 ± 0.0046 | 340.0 ± 0.0 | 0 |
| PGMM | 106.0 ± 0.0 | 0.1424 ± 0.0057 | 422.0 ± 0.0 | 0 |

Table 29: Results for problem OBSTCLBL

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 156.0 ± 0.0 | 0.1494 ± 0.0068 | 222.0 ± 0.0 | 0 |
| PGMM | 86.0 ± 0.0 | 0.1160 ± 0.0034 | 343.0 ± 0.0 | 0 |

Table 30: Results for problem OBSTCLBM

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 204.0 ± 0.0 | 0.1937 ± 0.0084 | 277.0 ± 0.0 | 0 |
| PGMM | 102.0 ± 0.0 | 0.1344 ± 0.0045 | 406.0 ± 0.0 | 0 |

Table 31: Results for problem OBSTCLBU

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|--------------------|-----------------------|--------------------|----------|
| SPG | 100000.0 ± 0.0 | 75.4462 ± 1.0604 | 162960.0 ± 0.0 | 10 |
| PGMM | 100000.0 ± 0.0 | 107.3698 ± 1.2700 | 399998.0 ± 0.0 | 10 |

Table 32: Results for problem ODNAMUR

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|---------------|----------|
| SPG | 1.0 ± 0.0 | 0.0016 ± 0.0022 | 3.0 ± 0.0 | 0 |
| PGMM | 1.0 ± 0.0 | 0.0008 ± 0.0000 | 3.0 ± 0.0 | 0 |

Table 33: Results for problem PENTDI

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|---------------|----------|
| SPG | 2.0 ± 0.0 | 0.0006 ± 0.0001 | 6.0 ± 0.0 | 0 |
| PGMM | 2.0 ± 0.0 | 0.0006 ± 0.0001 | 9.0 ± 0.0 | 0 |

Table 34: Results for problem PROBPENL

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-------------------|----------------------|--------------------|----------|
| SPG | 42572.0 ± 0.0 | 12.1452 ± 0.0717 | 91743.0 ± 0.0 | 10 |
| PGMM | 57391.0 ± 0.0 | 19.2342 ± 0.2189 | 229563.0 ± 0.0 | 0 |

Table 35: Results for problem QR3DLS

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|------------------|---------------------|------------------|----------|
| SPG | 2157.0 ± 0.0 | 0.7344 ± 0.0181 | 3509.0 ± 0.0 | 10 |
| PGMM | 928.0 ± 0.0 | 0.3761 ± 0.0092 | 3726.0 ± 0.0 | 10 |

Table 36: Results for problem QRTQUAD

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|---------------|---------------------|----------------|----------|
| SPG | 8.0 ± 0.0 | 0.0014 ± 0.0002 | 10.0 ± 0.0 | 0 |
| PGMM | 5.0 ± 0.0 | 0.0010 ± 0.0001 | 18.0 ± 0.0 | 0 |

Table 37: Results for problem S368

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-------------------|----------------------|--------------------|----------|
| SPG | 42572.0 ± 0.0 | 12.1928 ± 0.0810 | 91743.0 ± 0.0 | 10 |
| PGMM | 57391.0 ± 0.0 | 19.0344 ± 0.0833 | 229563.0 ± 0.0 | 0 |

Table 38: Results for problem SCON1LS

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 163.0 ± 0.0 | 0.0999 ± 0.0044 | 229.0 ± 0.0 | 0 |
| PGMM | 131.0 ± 0.0 | 0.1068 ± 0.0048 | 528.0 ± 0.0 | 0 |

Table 39: Results for problem TORSION1

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 211.0 ± 0.0 | 0.1336 ± 0.0056 | 310.0 ± 0.0 | 0 |
| PGMM | 129.0 ± 0.0 | 0.1103 ± 0.0075 | 514.0 ± 0.0 | 0 |

Table 40: Results for problem TORSION2

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 67.0 ± 0.0 | 0.0401 ± 0.0012 | 90.0 ± 0.0 | 0 |
| PGMM | 57.0 ± 0.0 | 0.0466 ± 0.0015 | 232.0 ± 0.0 | 0 |

Table 41: Results for problem TORSION3

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 87.0 ± 0.0 | 0.0546 ± 0.0022 | 108.0 ± 0.0 | 0 |
| PGMM | 49.0 ± 0.0 | 0.0433 ± 0.0026 | 194.0 ± 0.0 | 0 |

Table 42: Results for problem TORSION4

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 42.0 ± 0.0 | 0.0260 ± 0.0015 | 52.0 ± 0.0 | 0 |
| PGMM | 29.0 ± 0.0 | 0.0239 ± 0.0011 | 120.0 ± 0.0 | 0 |

Table 43: Results for problem TORSION5

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 59.0 ± 0.0 | 0.0366 ± 0.0021 | 70.0 ± 0.0 | 0 |
| PGMM | 26.0 ± 0.0 | 0.0215 ± 0.0009 | 102.0 ± 0.0 | 0 |

Table 44: Results for problem TORSION6

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 357.0 ± 0.0 | 0.2516 ± 0.0063 | 530.0 ± 0.0 | 0 |
| PGMM | 125.0 ± 0.0 | 0.1159 ± 0.0041 | 504.0 ± 0.0 | 0 |

Table 45: Results for problem TORSIONA

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 237.0 ± 0.0 | 0.1607 ± 0.0037 | 339.0 ± 0.0 | 0 |
| PGMM | 127.0 ± 0.0 | 0.1174 ± 0.0065 | 506.0 ± 0.0 | 0 |

Table 46: Results for problem TORSIONB

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 112.0 ± 0.0 | 0.0769 ± 0.0025 | 151.0 ± 0.0 | 0 |
| PGMM | 58.0 ± 0.0 | 0.0552 ± 0.0020 | 236.0 ± 0.0 | 0 |

Table 47: Results for problem TORSIONC

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|-----------------|---------------------|-----------------|----------|
| SPG | 107.0 ± 0.0 | 0.0738 ± 0.0048 | 135.0 ± 0.0 | 0 |
| PGMM | 51.0 ± 0.0 | 0.0488 ± 0.0023 | 202.0 ± 0.0 | 0 |

Table 48: Results for problem TORSIOND

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 43.0 ± 0.0 | 0.0291 ± 0.0011 | 52.0 ± 0.0 | 0 |
| PGMM | 27.0 ± 0.0 | 0.0269 ± 0.0013 | 112.0 ± 0.0 | 0 |

Table 49: Results for problem TORSIONE

| Algorithm | Iterations | Time | CostEvals | Failures |
|-----------|----------------|---------------------|-----------------|----------|
| SPG | 60.0 ± 0.0 | 0.0397 ± 0.0012 | 70.0 ± 0.0 | 0 |
| PGMM | 26.0 ± 0.0 | 0.0257 ± 0.0016 | 102.0 ± 0.0 | 0 |

Table 50: Results for problem TORSIONF