```
GurobiMICPSolver, robustness false (0)
/home/yue/anaconda3/envs/stl/bin/python /home/yue/Desktop/stl/test_reach_avoid.py
WARNING: pydrake import failed, Drake-based solvers disabled.
        Install drake (https://drake.mit.edu/installation.html)
        to use the Drake-based solvers.
Set parameter Username
Academic license - for non-commercial use only - expires 2024-09-06
Setting up optimization problem...
Setup complete in 0.25061821937561035 seconds.
<class 'gurobipy.MQuadExpr'>
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (linux64)

CPU model: AMD Ryzen 7 5800X 8-Core Processor, instruction set [SSE2|AVX|AVX2]
Thread count: 8 physical cores, 16 logical processors, using up to 16 threads

Optimize a model with 401 rows, 378 columns and 967 nonzeros
Model fingerprint: 0x785f68f7
Model has 44 quadratic objective terms
Variable types: 290 continuous, 88 integer (88 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+03]
  Objective range  [0e+00, 0e+00]
  QObjective range [2e-01, 2e-01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 1e+03]
Presolve removed 283 rows and 277 columns
Presolve time: 0.00s
Presolved: 118 rows, 101 columns, 295 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 56 continuous, 45 integer (45 binary)
Found heuristic solution: objective 15.7675874
Found heuristic solution: objective 3.8421179

Root relaxation: objective 0.000000e+00, 72 iterations, 0.00 seconds (0.00 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

    0     0    0.00000    0   20    3.84212    0.00000   100%     -    0s
    0     0    0.00000    0   20    3.84212    0.00000   100%     -    0s
    0     0    0.00000    0   20    3.84212    0.00000   100%     -    0s
    0     0    0.40000    0   20    3.84212    0.40000  89.6%     -    0s
    0     0    0.51429    0   18    3.84212    0.51429  86.6%     -    0s
H   0     0                       1.8977159    0.51429  72.9%     -    0s
    0     2    0.89998    0   18    1.89772    0.89998  52.6%     -    0s
H    4     3                       1.4589674    0.89998  38.3%  10.2    0s
H    9     7                       1.3877776    0.89998  35.1%   7.0    0s
*   11     7               4       1.0391952    0.89998  13.4%   6.8    0s
H   23     5                       0.9525207    0.89998  5.52%   6.5    0s

Cutting planes:
```

Relax-and-lift: 1

Explored 35 nodes (274 simplex iterations) in 0.01 seconds (0.01 work units)
Thread count was 16 (of 16 available processors)

Solution count 7: 0.952521 1.0392 1.38778 ... 15.7676

Optimal solution found (tolerance 1.00e-04)
Best objective 9.525207347568e-01, best bound 9.525207347568e-01, gap 0.0000%

Optimal Solution Found!

Solve time: 0.013654947280883789
Optimal robustness: 0.0

Process finished with exit code 0

```
GurobiMICPSolver, robustness true (1)
/home/yue/anaconda3/envs/stl/bin/python /home/yue/Desktop/stl/test_reach_avoid.py
WARNING: pydrake import failed, Drake-based solvers disabled.
        Install drake (https://drake.mit.edu/installation.html)
        to use the Drake-based solvers.
Set parameter Username
Academic license - for non-commercial use only - expires 2024-09-06
Setting up optimization problem...
Setup complete in 0.2467799186706543 seconds.
<class 'gurobipy.MQuadExpr'>
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (linux64)

CPU model: AMD Ryzen 7 5800X 8-Core Processor, instruction set [SSE2|AVX|AVX2]
Thread count: 8 physical cores, 16 logical processors, using up to 16 threads

Optimize a model with 401 rows, 378 columns and 967 nonzeros
Model fingerprint: 0xde19e6a7
Model has 44 quadratic objective terms
Variable types: 290 continuous, 88 integer (88 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+03]
  Objective range  [1e+00, 1e+00]
  QObjective range [2e-01, 2e-01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 1e+03]
Presolve removed 283 rows and 276 columns
Presolve time: 0.00s
Presolved: 118 rows, 102 columns, 367 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 57 continuous, 45 integer (45 binary)
Found heuristic solution: objective 15.7675874
Found heuristic solution: objective 3.8421179

Root relaxation: objective -2.000000e+00, 129 iterations, 0.00 seconds (0.00 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

    0     0   -2.00000    0   20    3.84212   -2.00000   152%     -    0s
    0     0   -2.00000    0   20    3.84212   -2.00000   152%     -    0s
    0     0   -2.00000    0   18    3.84212   -2.00000   152%     -    0s
H   0     0                       1.9582952   -2.00000   202%     -    0s
    0     0   -1.20002    0   18    1.95830   -1.20002   161%     -    0s
    0     0   -0.70414    0   18    1.95830   -0.70414   136%     -    0s
    0     0    0.55623    0   24    1.95830    0.55623  71.6%     -    0s
    0     0    0.55623    0   18    1.95830    0.55623  71.6%     -    0s
H   0     0                       1.8859921    0.55623  70.5%     -    0s
    0     0    0.55623    0   18    1.88599    0.55623  70.5%     -    0s
H   0     0                       1.3376091    0.55623  58.4%     -    0s
    0     2    0.55623    0   18    1.33761    0.55623  58.4%     -    0s
H   30    17                       1.0113864    0.55623  45.0%   7.9    0s
```

```
H   32    17                0.8593693    0.55623  35.3%   7.8    0s
*   72    23          14    0.7727472    0.55623  28.0%   6.6    0s
H  103    21                0.7185717    0.55623  22.6%   6.1    0s
*  104    21          17    0.7171759    0.55623  22.4%   6.1    0s

Cutting planes:
  MIR: 4

Explored 272 nodes (1511 simplex iterations) in 0.03 seconds (0.02 work units)
Thread count was 16 (of 16 available processors)

Solution count 10: 0.717176 0.718572 0.772747 ... 15.7676

Optimal solution found (tolerance 1.00e-04)
Best objective 7.171759272008e-01, best bound 7.171759272008e-01, gap 0.0000%

Optimal Solution Found!

Solve time:  0.028189897537231445
Optimal robustness:  0.5


Process finished with exit code 0
```

GurobiMICPSolver_time, full (2)
/home/yue/anaconda3/envs/stl/bin/python /home/yue/Desktop/stl/test_reach_avoid.py
WARNING: pydrake import failed, Drake-based solvers disabled.
Install drake (https://drake.mit.edu/installation.html)
to use the Drake-based solvers.
Set parameter Username
Academic license - for non-commercial use only - expires 2024-09-06
Setting up optimization problem...
Setup complete in 2.476916790008545 seconds.
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (linux64)

CPU model: AMD Ryzen 7 5800X 8-Core Processor, instruction set [SSE2|AVX|AVX2]
Thread count: 8 physical cores, 16 logical processors, using up to 16 threads

Optimize a model with 3481 rows, 4426 columns and 7039 nonzeros
Model fingerprint: 0x97f8d649
Model has 44 quadratic objective terms
Model has 1936 quadratic constraints
Variable types: 290 continuous, 4136 integer (1056 binary)
Coefficient statistics:
Matrix range [1e+00, 1e+03]
QMatrix range [1e+00, 1e+00]
QLMatrix range [1e+00, 1e+00]
Objective range [1e+00, 1e+00]
QObjective range [2e-01, 2e-01]
Bounds range [1e+00, 1e+02]
RHS range [1e+00, 1e+03]
QRHS range [1e+00, 1e+00]
Presolve added 274 rows and 0 columns
Presolve removed 0 rows and 2912 columns
Presolve time: 0.05s
Presolved: 3755 rows, 1514 columns, 8874 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 57 continuous, 1457 integer (841 binary)
Found heuristic solution: objective 8.2960096
Found heuristic solution: objective 5.7842563

Root relaxation: objective -9.995998e+00, 2119 iterations, 0.02 seconds (0.03 work units)

Nodes		Current Node			Objective Bounds			Work	
Expl	Unexpl	Obj	Depth	IntInf	Incumbent	BestBd	Gap	It/Node	Time
0	0	-9.99600	0	672	5.78426	-9.99600	273%	-	0s
0	0	-9.99600	0	670	5.78426	-9.99600	273%	-	0s
0	0	-0.80000	0	579	5.78426	-0.80000	114%	-	0s
0	0	-0.80000	0	453	5.78426	-0.80000	114%	-	0s
0	0	-0.80000	0	478	5.78426	-0.80000	114%	-	0s
0	0	-0.80000	0	567	5.78426	-0.80000	114%	-	0s
0	0	-0.80000	0	455	5.78426	-0.80000	114%	-	0s
0	0	-0.80000	0	355	5.78426	-0.80000	114%	-	0s
0	0	-0.80000	0	385	5.78426	-0.80000	114%	-	0s

```
    0     0  -0.80000    0  476    5.78426   -0.80000   114%    -    0s
    0     0  -0.80000    0  492    5.78426   -0.80000   114%    -    0s
    0     2  -0.80000    0  492    5.78426   -0.80000   114%    -    0s
H  374   302                      3.3523341   -0.80000   124%  30.2   0s
H  377   302                      3.2535396   -0.80000   125%  30.0   0s
H  386   302                      2.4469707   -0.80000   133%  30.5   0s
H  729   421                      1.2792869   -0.80000   163%  35.3   0s
H  831   430                      0.4251122   -0.80000   288%  38.2   0s
H 1387   411                       0.4150305   -0.80000   293%  40.3   1s
H 1451   417                       0.4145692   -0.80000   293%  41.0   1s
H 1455   417                       0.4139695   -0.80000   293%  41.1   1s
H 1462   417                       0.4131900   -0.80000   294%  41.3   1s
H 2160   464                       0.3981506   -0.60001   251%  42.5   1s
H 2235   455                       0.3805937   -0.60001   258%  42.3   1s
H 2319   457                       0.2395939   -0.60001   350%  41.7   1s
* 2631   434              65       0.1640598   -0.59394   462%  41.2   1s
* 2639   434              70       0.1640570   -0.59394   462%  41.1   1s
* 3128   504              72       0.0740771   -0.59394   902%  38.5   1s
H 3143   504                       0.0542260   -0.59394  1195%  38.4   1s
H 3278   226                      -0.0074429   -0.59394  7880%  37.5   1s
H 3385   203                      -0.0474793   -0.59394  1151%  40.3   2s

Cutting planes:
  Learned: 720
  Cover: 37
  Implied bound: 318
  Clique: 48
  MIR: 14
  StrongCG: 3
  Flow cover: 44
  RLT: 147
  Relax-and-lift: 113

Explored 3600 nodes (150819 simplex iterations) in 2.21 seconds (3.77 work units)
Thread count was 16 (of 16 available processors)

Solution count 10: -0.0474793 -0.00744287 0.054226 ... 0.41319

Optimal solution found (tolerance 1.00e-04)
Best objective -4.747926524324e-02, best bound -4.747926524324e-02, gap 0.0000%

Optimal Solution Found!

Solve time:  2.2128400802612305
Optimal robustness:  1.0


Process finished with exit code 0
```

GurobiMICPSolver_time, reduced (3)
/home/yue/anaconda3/envs/stl/bin/python /home/yue/Desktop/stl/test_reach_avoid.py
WARNING: pydrake import failed, Drake-based solvers disabled.
Install drake (https://drake.mit.edu/installation.html)
to use the Drake-based solvers.
Set parameter Username
Academic license - for non-commercial use only - expires 2024-09-06
Setting up optimization problem...
Setup complete in 1.5326941013336182 seconds.
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (linux64)

CPU model: AMD Ryzen 7 5800X 8-Core Processor, instruction set [SSE2|AVX|AVX2]
Thread count: 8 physical cores, 16 logical processors, using up to 16 threads

Optimize a model with 2161 rows, 2666 columns and 4399 nonzeros
Model fingerprint: 0x99ac54fe
Model has 44 quadratic objective terms
Model has 1056 quadratic constraints
Variable types: 290 continuous, 2376 integer (616 binary)
Coefficient statistics:
Matrix range [1e+00, 1e+03]
QMatrix range [1e+00, 1e+00]
QLMatrix range [1e+00, 1e+00]
Objective range [1e+00, 1e+00]
QObjective range [2e-01, 2e-01]
Bounds range [1e+00, 1e+02]
RHS range [1e+00, 1e+03]
QRHS range [1e+00, 1e+00]
Presolve added 960 rows and 0 columns
Presolve removed 0 rows and 1450 columns
Presolve time: 0.04s
Presolved: 3121 rows, 1216 columns, 7593 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 57 continuous, 1159 integer (551 binary)
Found heuristic solution: objective 5.7842563

Root relaxation: objective -9.421445e+00, 1878 iterations, 0.01 seconds (0.02 work units)

Nodes		Current Node		Objective Bounds		Work
Expl	Unexpl	Obj	Depth IntInf	Incumbent	BestBd	Gap	It/Node	Time
0	0	-9.42145	0 559	5.78426	-9.42145	263%	-	0s
H 0	0			5.3263823	-9.42145	277%	-	0s
0	0	-0.80000	0 520	5.32638	-0.80000	115%	-	0s
0	0	-0.80000	0 313	5.32638	-0.80000	115%	-	0s
0	0	-0.80000	0 315	5.32638	-0.80000	115%	-	0s
0	0	-0.76961	0 338	5.32638	-0.76961	114%	-	0s
0	0	-0.76961	0 411	5.32638	-0.76961	114%	-	0s
H 0	0			5.2763823	-0.76961	115%	-	0s
0	0	-0.76961	0 383	5.27638	-0.76961	115%	-	0s
0	0	-0.76961	0 428	5.27638	-0.76961	115%	-	0s

```
     0     0   -0.76547    0  421    5.27638   -0.76547   115%     -    0s
H    0     0                4.4631810   -0.76547   117%     -    0s
H    0     0                2.8231653   -0.76547   127%     -    0s
     0     2   -0.76547    0  421    2.82317   -0.76547   127%     -    0s
H   31    36                2.8215172   -0.76547   127%  58.2    0s
H   35    36                2.6512483   -0.76547   129%  54.3    0s
H   36    36                2.6503821   -0.76547   129%  53.2    0s
H   37    36                1.9025641   -0.76547   140%  51.9    0s
H   66    67                1.8661971   -0.76547   141%  41.7    0s
H   79    80                1.7996537   -0.76547   143%  43.0    0s
H   80    80                1.3813714   -0.76547   155%  45.1    0s
H  166   134                 0.6023195   -0.76547   227%  45.6    0s
H  191   133                 0.5859929   -0.76547   231%  44.6    0s
H  277   145                 0.4294623   -0.76547   278%  60.8    0s
H  457   153                 0.3894259   -0.76547   297%  59.9    0s
H  485   151                 0.2792505   -0.76547   374%  61.4    0s
H  494   151                 0.0469898   -0.76547  1729%  62.1    0s
H  539   152                 0.0067690   -0.76547     -  63.6    0s
H  543   152                 0.0065424   -0.76547     -  63.2    0s
H 1479   236                 -0.0330916   -0.75001  2166%  58.5    1s
H 2002   351                 -0.0474793   -0.60001  1164%  55.8    1s
 10204   205     cutoff   26       -0.04748   -0.46106   871%  51.1    5s
 41411     9   -0.04760   74  100   -0.04748   -0.04760  0.26%  21.8   10s
```

Cutting planes:
  Learned: 1078
  Gomory: 2
  Cover: 102
  Implied bound: 427
  Clique: 55
  MIR: 22
  StrongCG: 2
  Flow cover: 83
  Inf proof: 1
  RLT: 172
  Relax-and-lift: 194
  BQP: 5
  PSD: 1

Explored 42463 nodes (909378 simplex iterations) in 10.16 seconds (15.17 work units)
Thread count was 16 (of 16 available processors)

Solution count 10: -0.0474793 -0.0330916 0.00654235 ... 0.602319

Optimal solution found (tolerance 1.00e-04)
Best objective -4.747926524324e-02, best bound -4.747926524324e-02, gap 0.0000%

Optimal Solution Found!

Solve time: 10.16611909866333
Optimal robustness: 1.0

Process finished with exit code 0