```
GurobiMICPSolver, robustness false (0)
/home/yue/anaconda3/envs/stl/bin/python /home/yue/Desktop/stl/main.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 0.051386356353759766 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 57 rows, 77 columns and 142 nonzeros
Model fingerprint: 0x854d1d65
Model has 42 quadratic objective terms
Variable types: 71 continuous, 6 integer (6 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+03]
  Objective range  [0e+00, 0e+00]
  QObjective range [2e+00, 2e+00]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 1e+03]
Presolve removed 31 rows and 32 columns
Presolve time: 0.00s
Presolved: 26 rows, 45 columns, 74 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 40 continuous, 5 integer (5 binary)
Found heuristic solution: objective 8.9448632

Root relaxation: objective 0.000000e+00, 5 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    2    8.94486    0.00000  100%     -    0s
     0     0    0.00000    0    2    8.94486    0.00000  100%     -    0s
     0     0    0.00000    0    2    8.94486    0.00000  100%     -    0s
     0     0    0.00000    0    2    8.94486    0.00000  100%     -    0s
     0     0    0.00000    0    2    8.94486    0.00000  100%     -    0s
     0     2    0.00000    0    2    8.94486    0.00000  100%     -    0s

Explored 3 nodes (45 simplex iterations) in 0.00 seconds (0.00 work units)
Thread count was 16 (of 16 available processors)

Solution count 1: 8.94486

Optimal solution found (tolerance 1.00e-04)
Best objective 8.944863227724e+00, best bound 8.944863227724e+00, gap 0.0000%
```

Optimal Solution Found!

Solve time: 0.004091978073120117
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/main.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 0.05025196075439453 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 57 rows, 77 columns and 142 nonzeros
Model fingerprint: 0xeae04105
Model has 42 quadratic objective terms
Variable types: 71 continuous, 6 integer (6 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+03]
  Objective range  [1e+00, 1e+00]
  QObjective range [2e+00, 2e+00]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 1e+03]
Presolve removed 31 rows and 31 columns
Presolve time: 0.00s
Presolved: 26 rows, 46 columns, 79 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 41 continuous, 5 integer (5 binary)
Found heuristic solution: objective 8.9448632

Root relaxation: objective -7.980394e+02, 33 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 -798.03945    0    5    8.94486 -798.03945  9022%     -    0s

Explored 1 nodes (33 simplex iterations) in 0.00 seconds (0.00 work units)
Thread count was 16 (of 16 available processors)

Solution count 1: 8.94486

Optimal solution found (tolerance 1.00e-04)
Best objective 8.944863227724e+00, best bound 8.944863227724e+00, gap 0.0000%

Optimal Solution Found!

Solve time:  0.0033850669860839844
Optimal robustness:  0.0
```

```
Process finished with exit code 0
```

```
GurobiMICPSolver_time, full (2)
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 0.3541536331176758 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 447 rows, 593 columns and 916 nonzeros
Model fingerprint: 0x3b576201
Model has 42 quadratic objective terms
Model has 252 quadratic constraints
Variable types: 71 continuous, 522 integer (132 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+00, 2e+00]
  Bounds range     [1e+00, 1e+02]
  RHS range        [1e+00, 1e+03]
  QRHS range       [1e+00, 1e+00]
Presolve added 503 rows and 0 columns
Presolve removed 0 rows and 228 columns
Presolve time: 0.01s
Presolved: 950 rows, 365 columns, 2321 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 41 continuous, 324 integer (125 binary)
Found heuristic solution: objective 31.7285414
Found heuristic solution: objective 31.1829537

Root relaxation: objective -9.292541e+02, 1098 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 -929.25410    0  253   31.18295 -929.25410  3080%     -    0s
    0     0 -919.21319    0  242   31.18295 -919.21319  3048%     -    0s
    0     0  -19.96314    0  278   31.18295  -19.96314   164%     -    0s
H   0     0                17.1388026  -19.96314   216%     -    0s
    0     0  -16.00000    0  278   17.13880  -16.00000   193%     -    0s
    0     0   -8.86120    0  264   17.13880   -8.86120   152%     -    0s
    0     0   -8.86120    0  264   17.13880   -8.86120   152%     -    0s
    0     0   -8.86120    0  262   17.13880   -8.86120   152%     -    0s
    0     0   -8.86120    0  260   17.13880   -8.86120   152%     -    0s
    0     0   -8.86120    0  254   17.13880   -8.86120   152%     -    0s
```

```
     0     2   -8.86120    0  254   17.13880   -8.86120   152%     -    0s
H   70    51                    14.4350989   -8.86120   161%  15.3    0s
H  459   380                    13.9721360   -8.86120   163%   8.8    0s
* 1512   851           179      11.1388026   -8.86120   180%   7.6    0s
H 1576   850                    11.0111985   -8.86120   180%   7.6    0s
H 2549  1366                    10.9483264   -8.86120   181%   7.8    0s
* 2595  1049           190       7.9721360   -8.86120   211%   7.8    0s
H 3878   937                     7.9448632   -8.86120   212%   7.9    0s

Cutting planes:
  Learned: 5
  Gomory: 1
  Implied bound: 55
  MIR: 43
  Flow cover: 5
  RLT: 23
  Relax-and-lift: 5

Explored 6306 nodes (48669 simplex iterations) in 0.55 seconds (0.70 work units)
Thread count was 16 (of 16 available processors)

Solution count 10: 7.94486 7.97214 10.9483 ... 31.7285

Optimal solution found (tolerance 1.00e-04)
Best objective 7.944863227726e+00, best bound 7.944863227726e+00, gap 0.0000%

Optimal Solution Found!

Solve time:  0.5508909225463867
Optimal robustness:  1.0


Process finished with exit code 0
```

```
GurobiMICPSolver_time, reduced (3)
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 0.316791296005249 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 402 rows, 533 columns and 826 nonzeros
Model fingerprint: 0xd530e3c5
Model has 42 quadratic objective terms
Model has 222 quadratic constraints
Variable types: 71 continuous, 462 integer (117 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+00, 2e+00]
  Bounds range     [1e+00, 1e+02]
  RHS range        [1e+00, 1e+03]
  QRHS range       [1e+00, 1e+00]
Presolve added 482 rows and 0 columns
Presolve removed 0 rows and 188 columns
Presolve time: 0.01s
Presolved: 884 rows, 345 columns, 2169 nonzeros
Presolved model has 40 quadratic objective terms
Variable types: 41 continuous, 304 integer (115 binary)
Found heuristic solution: objective 36.7102311
Found heuristic solution: objective 25.9448631

Root relaxation: objective -9.323457e+02, 870 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 -932.34568    0  218   25.94486 -932.34568  3694%     -    0s
     0     0 -916.32843    0  206   25.94486 -916.32843  3632%     -    0s
     0     0 -119.45909    0  251   25.94486 -119.45909   560%     -    0s
H    0     0                      17.1388026 -119.45909   797%     -    0s
     0     0  -51.54821    0  251   17.13880  -51.54821   401%     -    0s
     0     0  -37.69291    0  253   17.13880  -37.69291   320%     -    0s
     0     0   -8.52786    0  245   17.13880   -8.52786   150%     -    0s
     0     0   -8.52786    0  246   17.13880   -8.52786   150%     -    0s
     0     0   -8.02786    0  233   17.13880   -8.02786   147%     -    0s
     0     0   -8.02786    0  233   17.13880   -8.02786   147%     -    0s
```

```
    0     0  -8.02786    0  231   17.13880   -8.02786   147%    -    0s
    0     2  -8.02786    0  231   17.13880   -8.02786   147%    -    0s
H   82    54                     13.9721360   -8.02786   157%  12.0    0s
* 1113   483             143      11.9721360   -8.02786   167%   8.9    0s
H 1149   480                      10.9483264   -8.02786   173%   9.0    0s
H 1236   444                       7.9483265   -8.02786   201%   9.5    0s
H 1241   444                       7.9483264   -8.02786   201%   9.5    0s
H 2531   672                       7.9448632   -8.02786   201%   9.9    0s

Cutting planes:
  Learned: 2
  Implied bound: 68
  MIR: 31
  Flow cover: 1
  RLT: 21
  Relax-and-lift: 2

Explored 6482 nodes (60219 simplex iterations) in 0.51 seconds (0.68 work units)
Thread count was 16 (of 16 available processors)

Solution count 9: 7.94486 7.94833 7.94833 ... 36.7102

Optimal solution found (tolerance 1.00e-04)
Best objective 7.944863227726e+00, best bound 7.944863227726e+00, gap 0.0000%

Optimal Solution Found!

Solve time:  0.5100650787353516
Optimal robustness:  1.0000000000000002


Process finished with exit code 0
```