Implement MILP solver within Qiskit Optimization

QAMP-Checkpoint 1
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About us

- I (Yunzhe) was a MSc Applied Physics @ TU Delft.

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- My mentor Takashi is a Research Scientist @ IBM Tokyo

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Motivation

- Mixed-Interger Linear Programming (MILP) solver
    - A powerful solver that allows part of variables to take only integer values.

    - *scipy.optimize.milp* come out with Scipy v1.9.0 (July 29 2022)

    - Useful for many problems, but not incorporated with *Qiskit Optimization.*

```
scipy.optimize.milp

scipy.optimize.milp(c, *, integrality=None, bounds=None, constraints=None,
options=None)
```

Why we need MILP for Qiskit?

- In qiskit-optimization, we can use CPLEX and Gurobi to solve quadratic problems
  - but they are commercial APIs and limited by free access!
  - On the other hand: Scipy doesn't ask for you to pay :p.

- Our goal: integrate the MILP solver with qiskit-optimization library.
  - We expect to build a `*MILPOptimizer*` class in `*qiskit_optimization.algorithms*`
  - Qiskit-optimization users will freely solve linear problems with out limitation!