

Integer Programming: MIQP and MILP

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Optimization

- A process to find the best solution to a problem based on a set of objectives subject to constraints.

Importance of Optimization in Real-World Applications

- Optimization is used in various fields, such as finance, engineering, logistics, healthcare, and many others.
- It helps in making better decisions, improving efficiency, reducing costs, and achieving optimal outcomes.

Example: Clothing Manufacturing

A clothing manufacturer wants to produce summer and winter shirts, both made from cotton. The summer shirts require 2 yards of blue cotton and 3 yards of red cotton to produce. The winter shirts require 3 yards of blue cotton and 1 yard of red cotton to produce.

The manufacturer has a total of 30 yards of blue cotton and 20 yards of red cotton available to use for production. The profit from selling one summer shirt is \$20, and the profit from selling one winter shirt is \$25.

The manufacturer wants to maximize their profit from selling the summer and winter shirts, while using no more than the available cotton. How many summer and winter shirts should they produce to achieve this goal?

Linear Programming

- Definition of linear programming
- LP formulation
- Solving LP problems using simplex algorithm
- LP software tools

Integer Programming

- Definition of integer programming
- IP formulation
- Solving IP problems using branch-and-bound algorithm
- IP software tools

Mixed-Integer Linear Programming

- Definition of mixed-integer linear programming
- MILP formulation
- Solving MILP problems using branch-and-bound algorithm
- MILP software tools

Mixed-Integer Quadratic Programming

- Definition of mixed-integer quadratic programming
- MIQP formulation
- Solving MIQP problems using branch-and-bound algorithm
- MIQP software tools

Case Studies and Applications

- Examples of real-world problems that can be solved using integer programming
- Demonstration of solving a sample problem using software tools

Conclusion and Future Directions

- Summary of key points
- Future directions in optimization
- Acknowledgments (if applicable)

- List of references cited in the presentation

Thank You

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