Operations Research Interview Questions

(& brainstorming ideas) ongoing/incoming

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1 Location Modeling

1. Set Covering

$$\begin{aligned}
\max \quad & \sum_j a_j y_j \\
\text{s.t} \quad & \sum_{i \in C_j} x_i \geq y_j \quad \forall j \\
& \sum_i x_i = k \\
& x_i, y_j \in \{0, 1\}
\end{aligned}$$

https://optimization.cbe.cornell.edu/index.php?title=Set_covering_problem

https://en.wikipedia.org/wiki/Set_cover_problem

2. P-median

3. MCLP

Maximal Covering Location Problem

$$\begin{aligned}
& \max \sum_{i \in I} h_i y_i \\
& s.t. \\
& \qquad \sum_{j \in N_i} x_j \geq y_i, \qquad && i \in I \\
& \qquad \sum_{j \in J} x_j = p, \\
& \qquad x_j \in \{0,1\}, && j \in J \\
& \qquad \mathrm{y}_i \in \{0,1\}, && i \in I
\end{aligned}$$

https://en.wikipedia.org/wiki/Maximum_coverage_problem

4. Location Allocation

1. Can you write a simple facility allocation model? When we use location-allocation modeling?

Verbal:

Objective: Min cost, $FixedCost_f\ .open_f$

St. number of facility <= 10

Allocation_f,c <= availability_f

2 Computational Complexity

1. Please describe one **linear optimization problem/algorithm** and state its **computational complexity**.

Linear programming:

Linear programming is **an optimization technique for a system of linear constraints and a linear objective function**. An objective function defines the quantity to be optimized, and the goal of linear programming is to find the values of the variables that maximize or minimize the objective function.

Complexity

The complexity of an optimization algorithm depends on the following factors:

1- Number of iterations, 2- Number of individuals in the population, 3-complexity of the objective function, 4- If you sort the individuals, the complexity of sorting should be added

Example O(N*M*P*Q) where N is #1, M is #2, P is #3, Q is #4

The better estimation for #1 and #2 is computing the NFE(number of function evaluations) source: https://www.researchgate.net/post/How-can-I-calculate-the-computational-complexity-of-any-optimization-algorithm

The computational complexity, in general, depends on the optimization algorithm and the technique that you use. In some algorithms, the complexity can be measured by the time that the CPU needs to run the algorithm, others consider the computational complexity as the number of nested loops (for loops and others) per run and can be written as O(x), where x is your nested loops.

3 Solution Algorithm

5. Branch & Cut