



Cargo Ship Loading Plan

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Problem Description & Dataset

max:

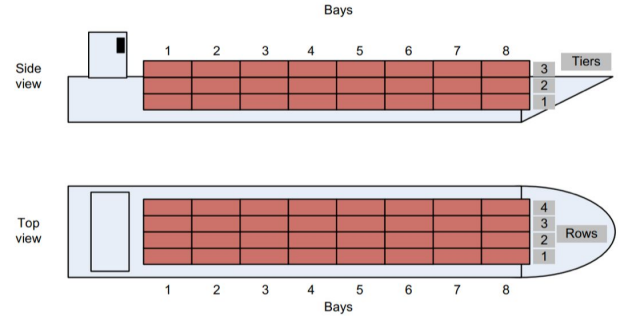
Container count, X-axis balance, Z-axis balance

subject to:

Weight Order (Much heavier containers should be placed below lighter ones)

Destination Order (Containers arriving at the destination first should be placed on top)

No repeating containers (One container can only be placed in one empty cell)



Containers Initialization	
Destination	Weight
0	0.2
0	0.636
2	0.559
0	0.1655
2	0.267
2	0.1433
0	0.616
1	0.4087
0	0.1685
2	0.3162
...	...

0:Hamburg

1:Aarhus

2:Copenhagen

NSGA-II

Non-Dominated Sorting:

Maintain solutions across the Pareto front

Crowding Distance:

Ensure the explorations of the Pareto front

Elitism:

Keep the most promising solutions

Genetic Operators:

GA helps explore the solution space efficiently

Diversity Maintenance:

Provide options with trade-offs between objectives

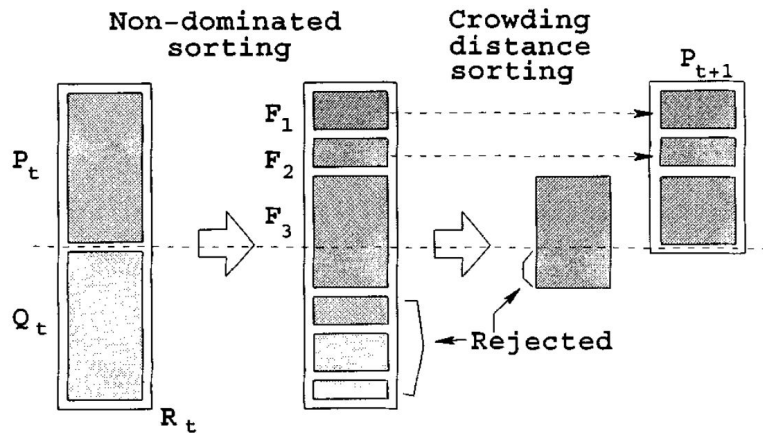
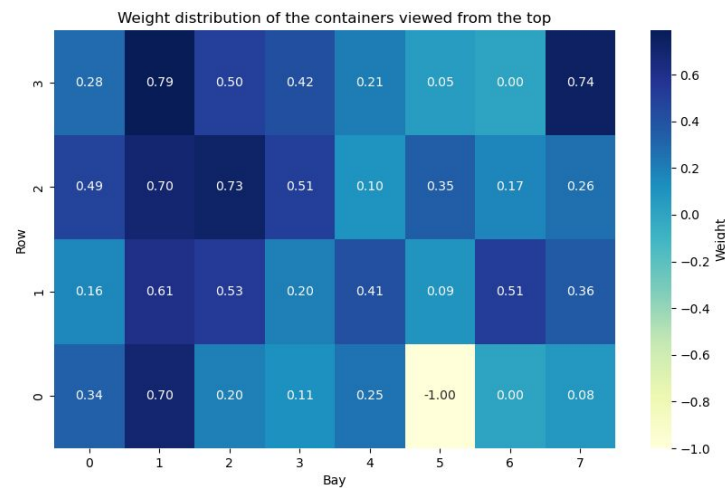
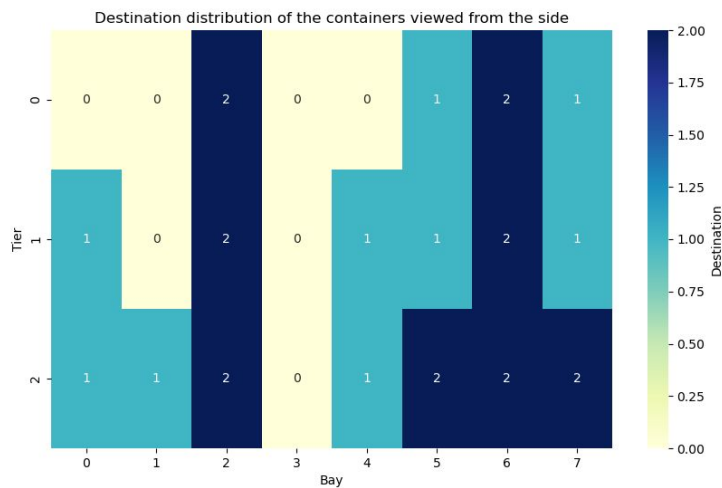


Fig. 2. NSGA-II procedure.

K. Deb, A. Pratap, S. Agarwal and T. Meyarivan, "A fast and elitist multiobjective genetic algorithm: NSGA-II," in IEEE Transactions on Evolutionary Computation, vol. 6, no. 2, pp. 182-197, April 2002, doi: 10.1109/4235.996017.

Results and Visualization



One solution candidate visualized. (Dozens obtained which form the Pareto front)
Balance weight distribution with “symmetric” container loading configurations.
Early arriving containers are put at the top of those arriving later.

Discussion & Summary

We ...

- ❑ used genetic algorithm to solve the problem rather than traditional multicriteria optimization methods.
- ❑ defined constraint and objective functions based on real scenarios.
- ❑ obtained multiple optimal solution sets within specified generations.
- ❑ Visualized the loading plan with multiple 2D figures.