POLYTECH TOURS
cnrs Équipe OC ERL-CNRS 6305
LI Laboratoire d'Informatique EA 6300

A parallel multi-start local search for the traveling salesman problem

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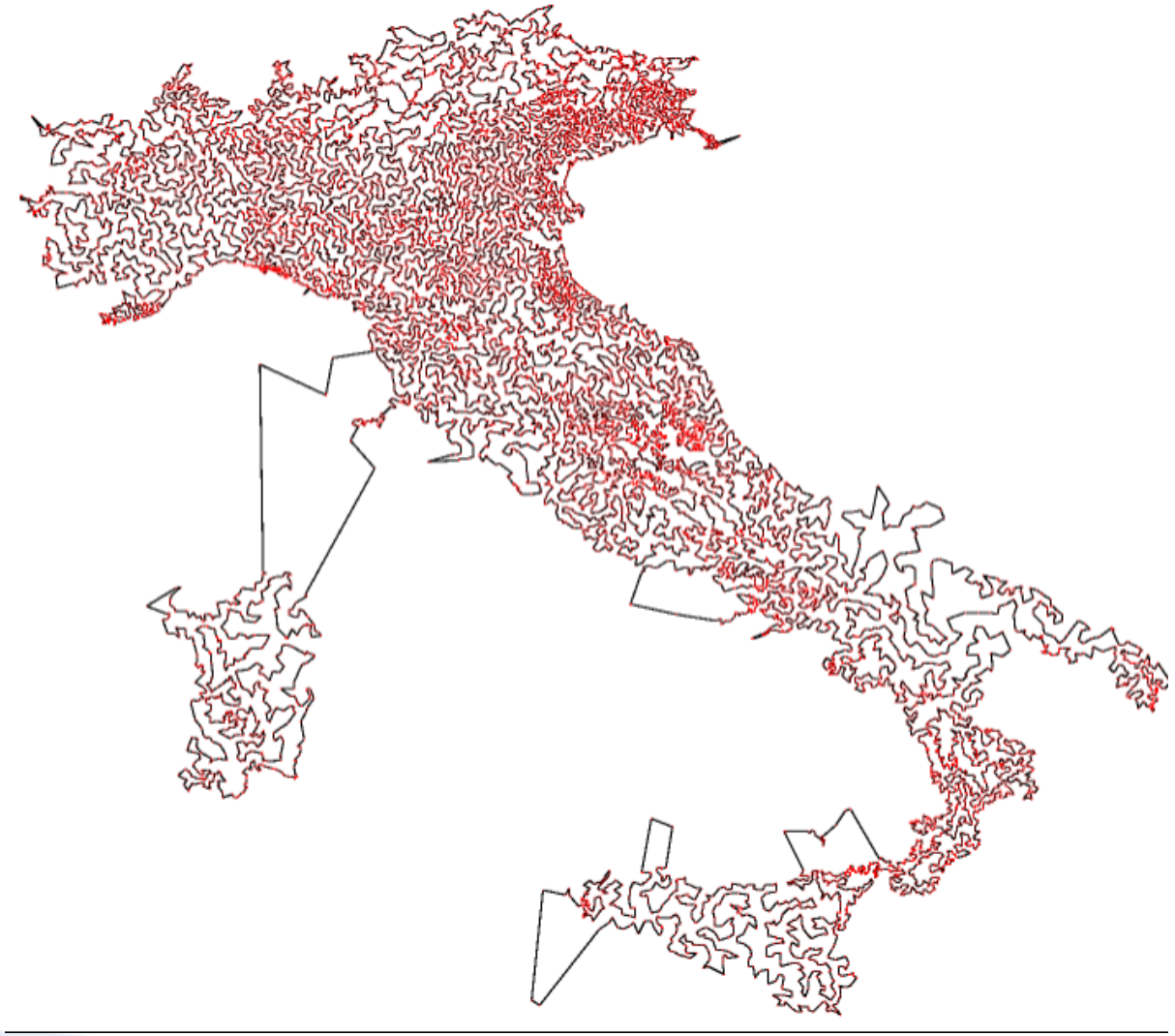
The problem

- A salesman will travel to all the cities in a map. That is saying linking all points in a map with one cycle. The cost of the trip is supposed to be as less as possible.
- It is an NP-hard (non-deterministic polynomial-time hardness) problem in combinatorial optimization, important in operations research and theoretical computer science.



Problem decomposition

- Tasks List:

I. My Algorithm

- Load data
- Mult-start local search
- Result

II. MLS

- Random initialization
- **Local search**
- Return the best solution

III. Local Search

- Generate a random solution
- **Explore neighborhoods**
- Compare and update the best solution

IV. Explore neighborhoods

- **Swap with following cities**
- Compare and update the best solution

Problem decomposition

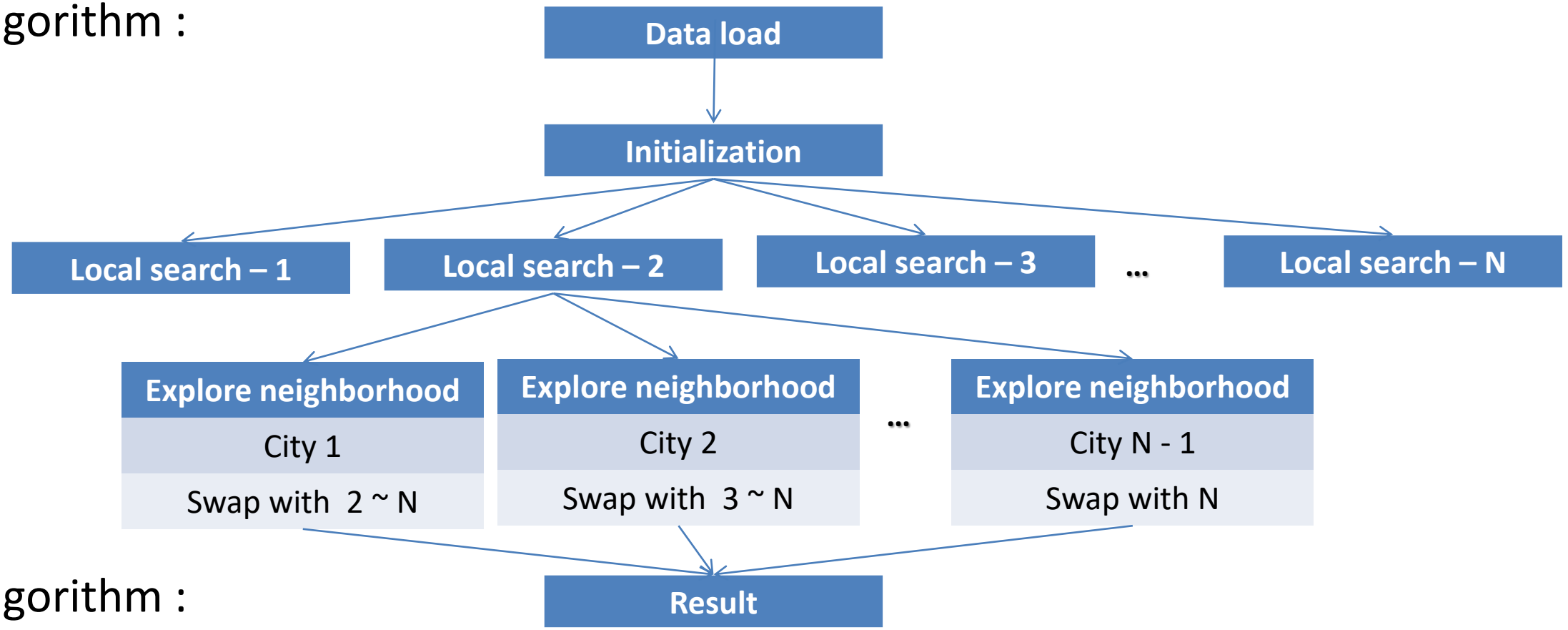
- Task decompose:

My Algorithm :

MLS :

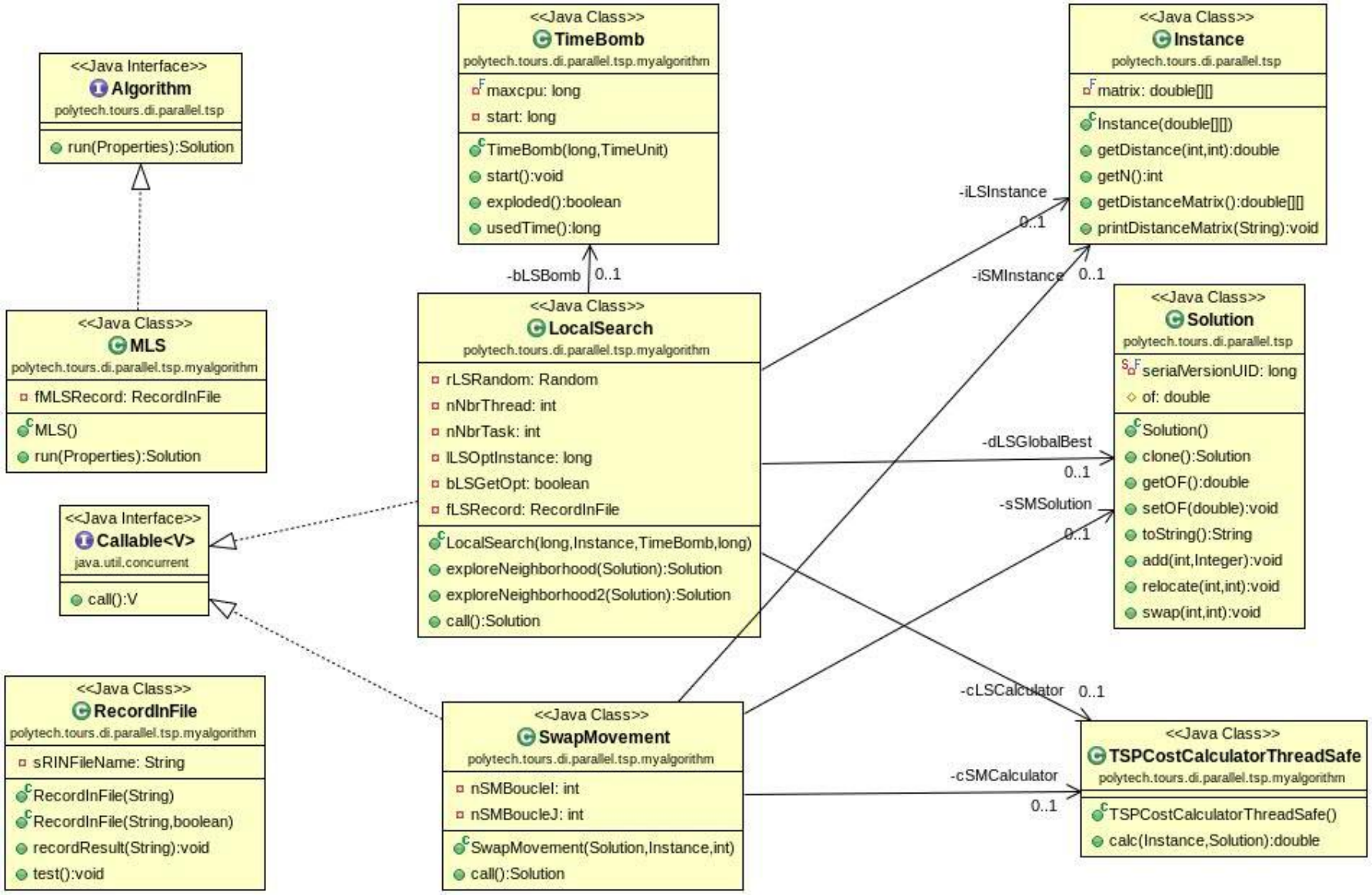
LS :
(Sync.)

EN :
(Sync.)

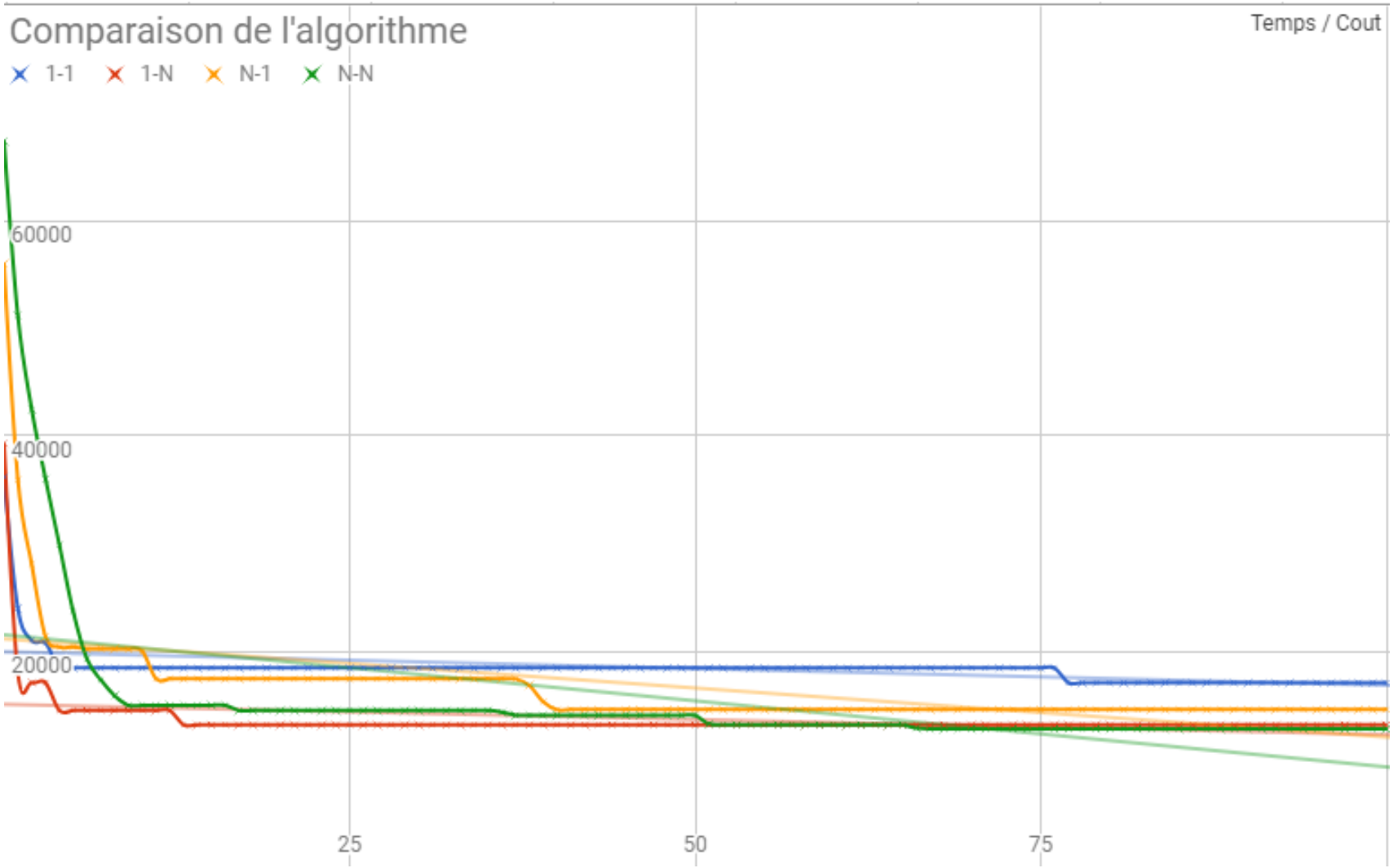


My Algorithm :

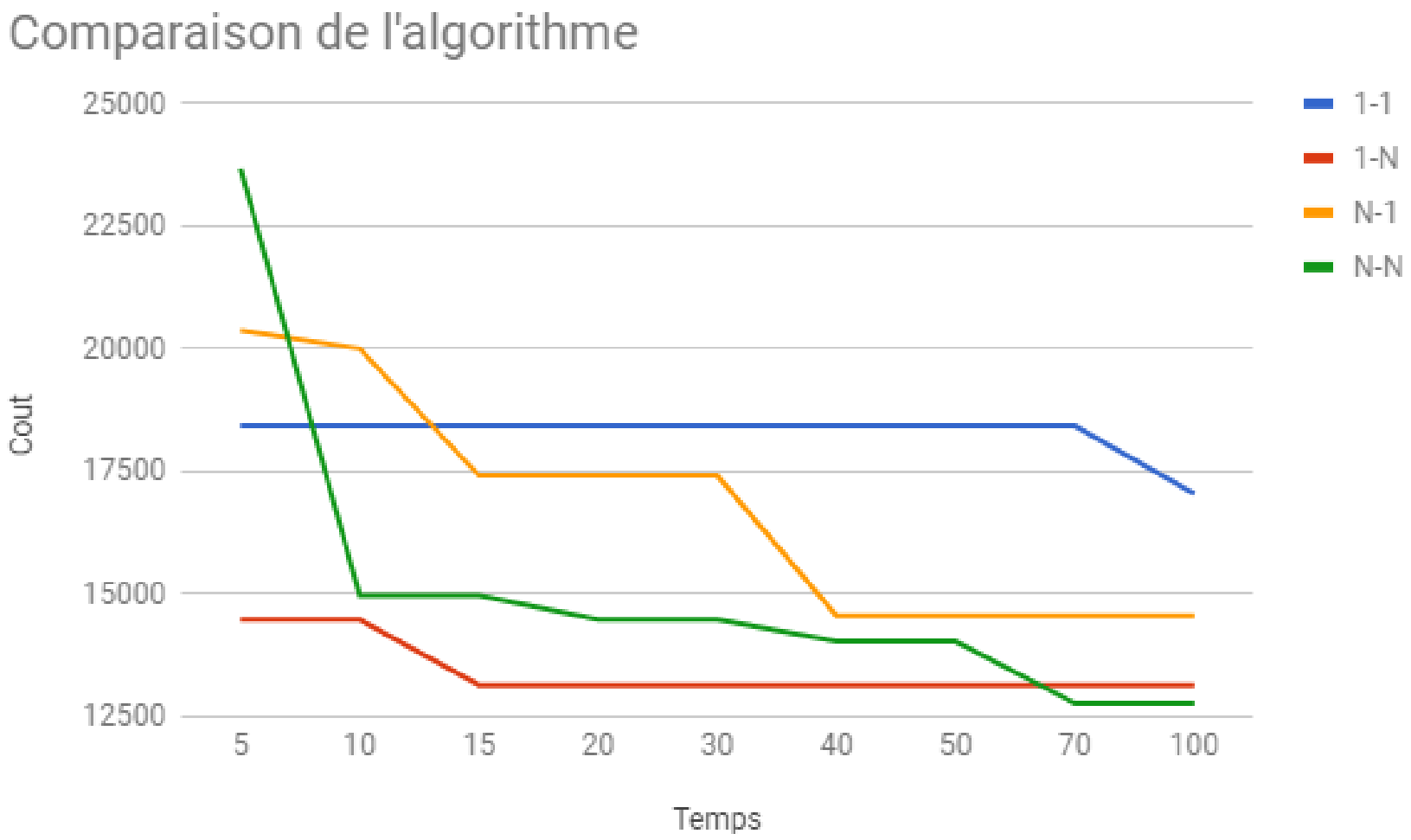
Implementation – Class diagram



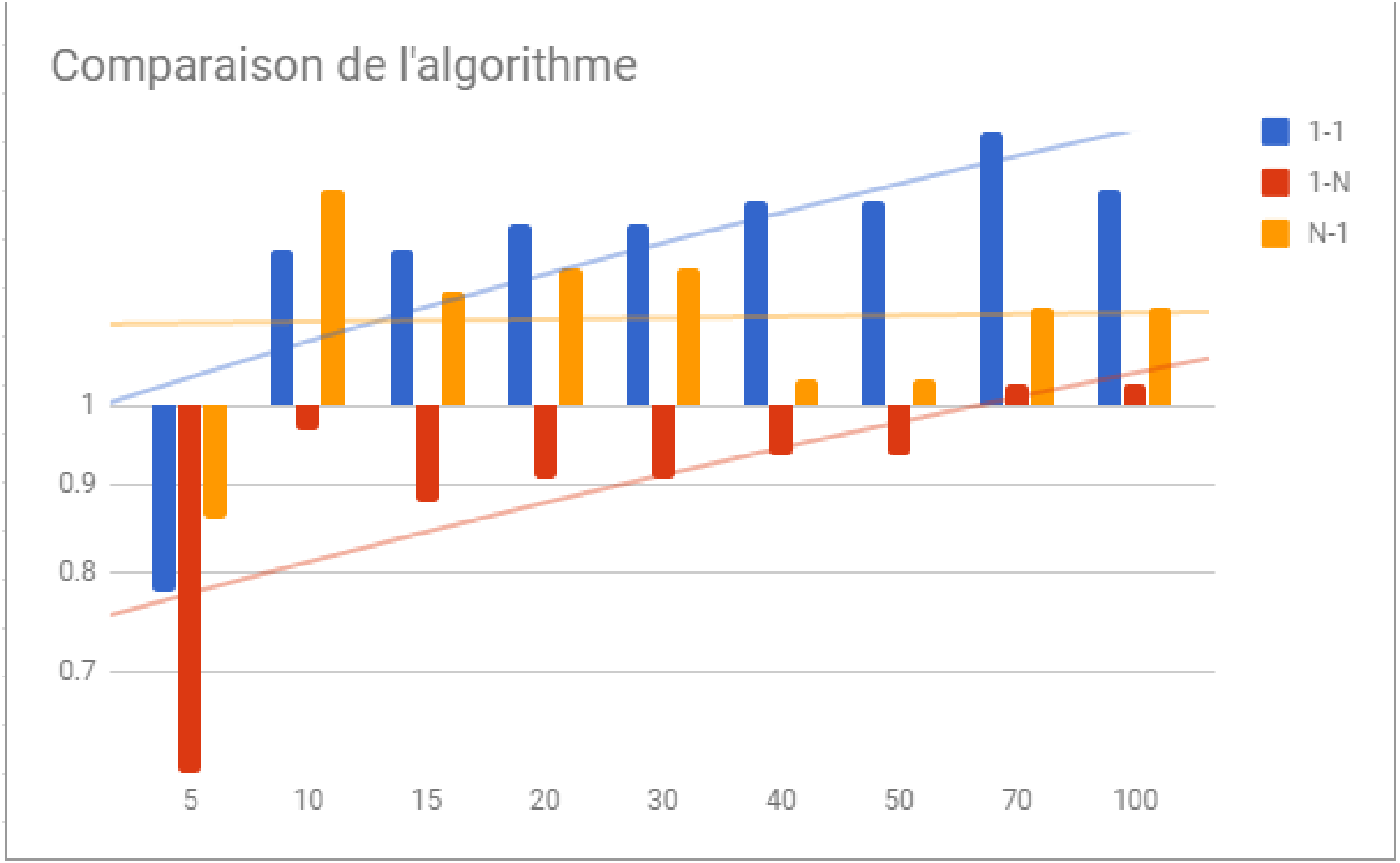
Results – Qa194



Results – Qa194

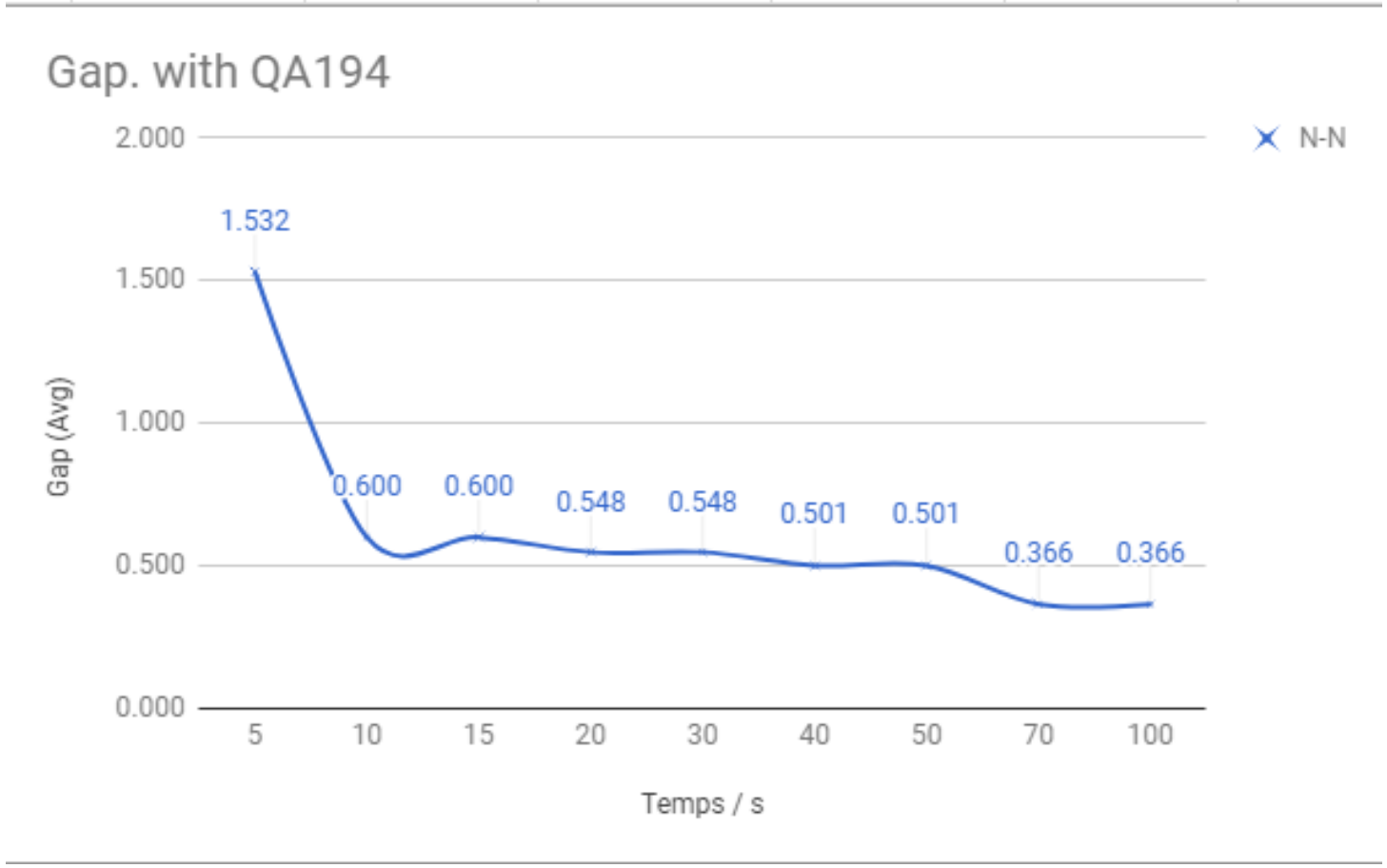


Results – Qa194

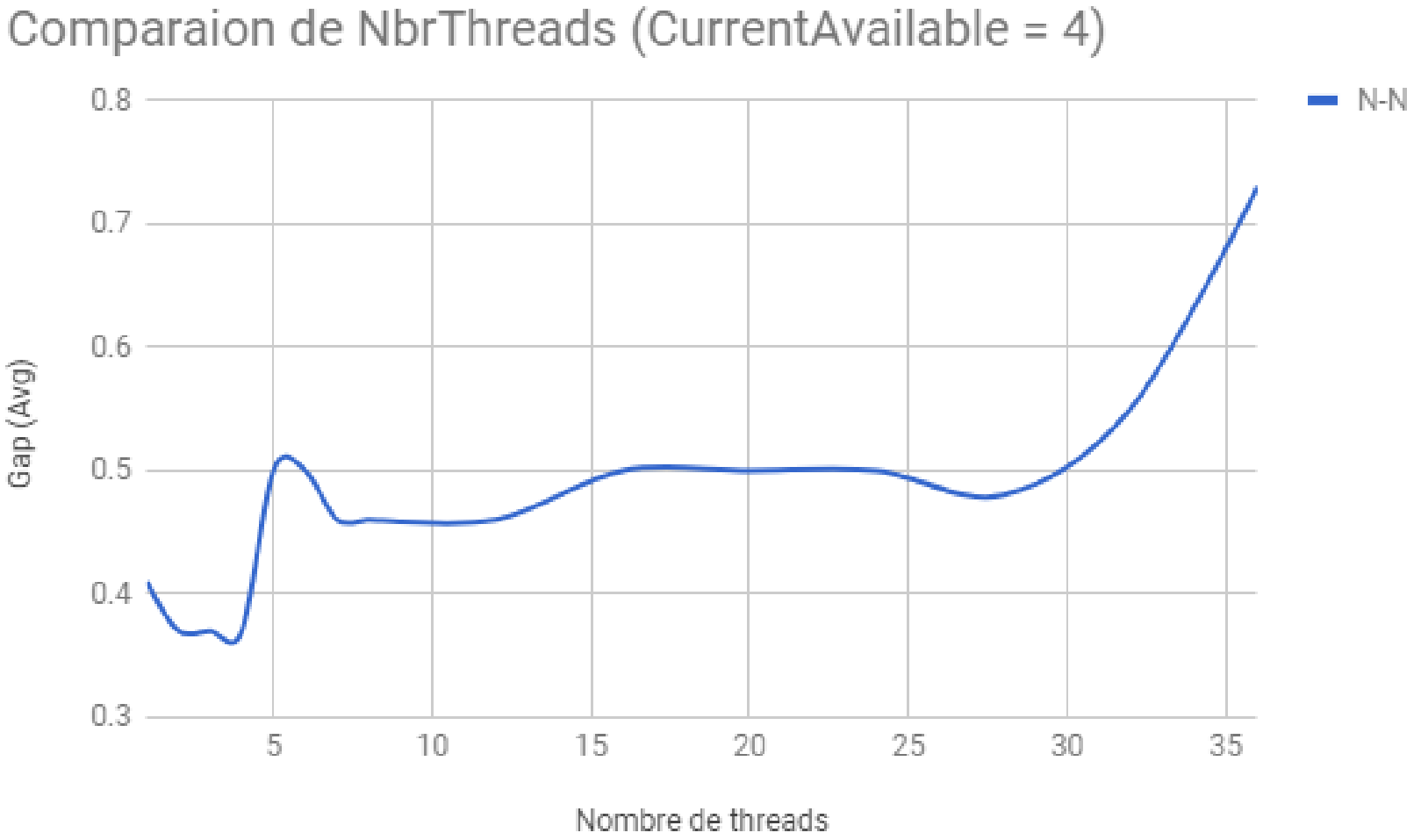


Results – Qa194

$$gap = \frac{f(your\ algorithm) - f(optimal\ solution)}{f(optimal\ solution)}$$



Results – Qa194



Conclusions

- Effect of parallelism
  - Comparison
- Degree of concurrency
  - The relation between tasks and threads
  - The number of tasks – is it suitable for parallelism
- Number of threads
  - Depends on machine