Problem

- Dance line
- Some dancers want to be close, others apart
- Try to find optimal permutation
- Problem is hard - $O(n!)$

Methods

- Classic local search
- Variable Neighbourhood Search
- Memetic algorithm

Local Search and VNS

- Local search is a special case of VNS
- Multiple restarts
- Tend to get stuck in local optimum

Local Search and VNS

Neighbourhoods used:

- Swap two neighbours
- Split the permutation into two parts and swap them
- Swap two elements in the permutation
- Choose a part of the permutation and reverse it
- Combinations of above

Memetic Algorithm

Based on a simple genetic algorithm.

- Selection:
  - Two variants of Roulette wheel selection
  - Deterministic tournament selection
  - Truncation selection
  - Tournaments selection
  - Hybrid approach
- Ordered crossover
- Mutation

Memetic Algorithm

Additional improvements:

- Local search with limited number of steps after selection
- Local search before returning the result

Results on DS3.csv

- Local search: 1992
- VNS: 1985
- MA: 1992

Result evaluation

Local search worked well because it's simple and fast.

Result evaluation

There was no added value in using multiple neighbourhoods.

Result evaluation

MA works well, but is very slow and sometimes unpredictable.

Possible improvements

- Faster language?
- More careful parameter selection for MA?
- Finding some other neighborhood?
- Replacing VNS with a different algorithm?

Questions