Traveling Tournament Problem

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Problem Solving and Search in AI,
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Outline

- **Approach**
- Parameter Exploration
- Results

Representation

- i×j matrix G
- i ... round
- j ... team 1
- $g_{i,j} \in G$ ... team 2
- $\mathrm{sgn}(g_{i,j})$ ... negative away, positive home

Approach

- Greedy Randomized Search Procedure (GRASP)
  - construct multiple initial solutions
  - multiple local searches
- Problem relaxation
  - soft / hard constraints + penalty

Construction

- Randomized (iterated local search)
- Randomized with heuristic (GRASP)
  - Random Greedy

GRASP Construction

- create “virtual schedule”
- real teams → virtual schedule (greedy)
  - count # of consecutive team-pairs
  - sort real teams by distance
  - assign closely located teams to high count

GRASP Construction

continued

- create set of candidate pairs
  - team-pair with smallest distance
  - team-pairs < threshold
- choose randomly

GRASP Construction

extended

- avoid known solutions
  - tabu list
  - different virtual schedules
    - [AMHV06]
    - [GS07]

Tabu Search

- recency based memory
- complete schedules stored
- no aspiration criteria
- union of multiple neighborhoods

Neighborhoods

- Shift Round
- Swap Home-Visitor
- Swap Match Round
- Swap Matches
- 2-opt Swap Rounds
- 2-opt Swap Teams

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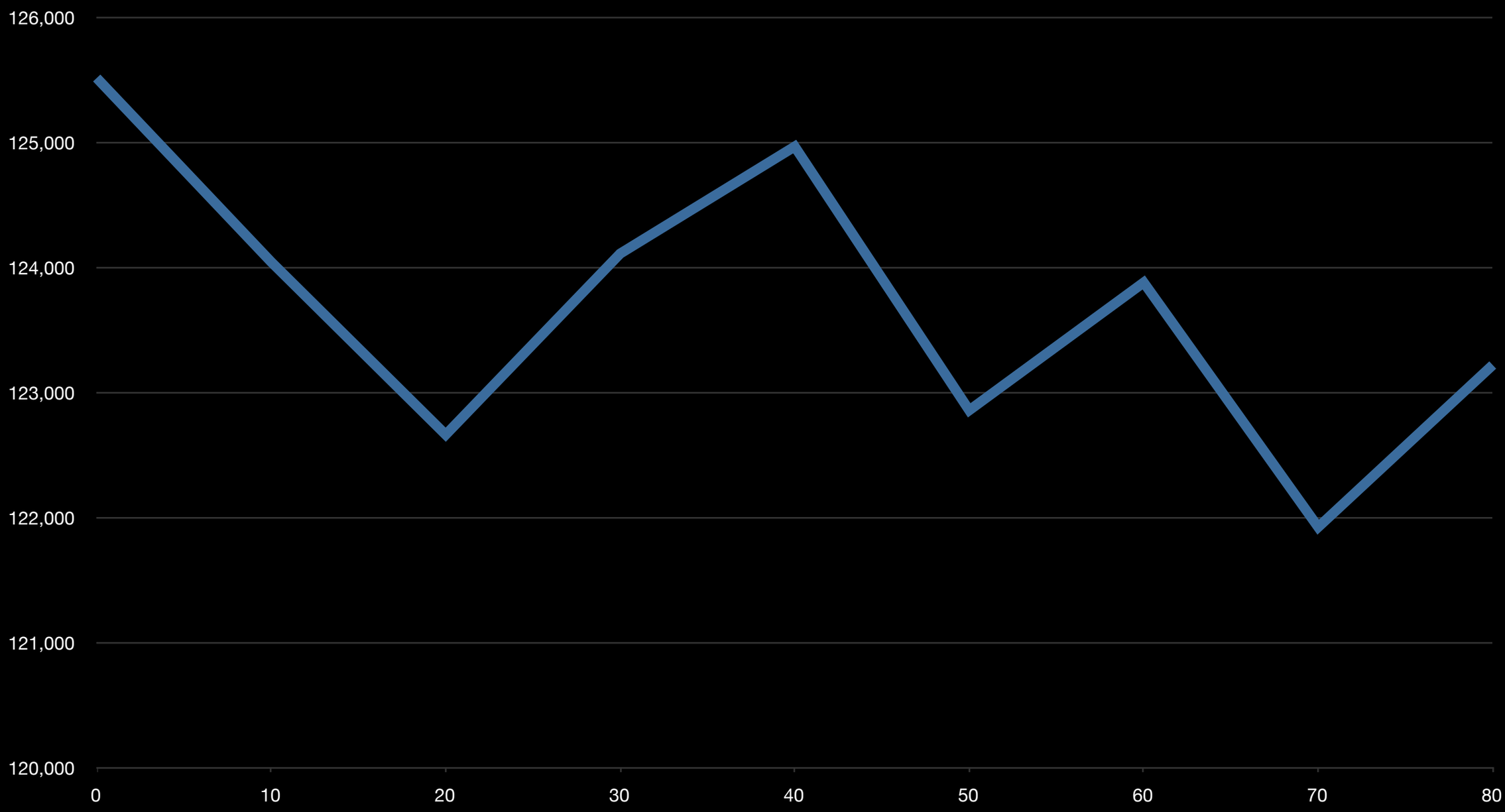
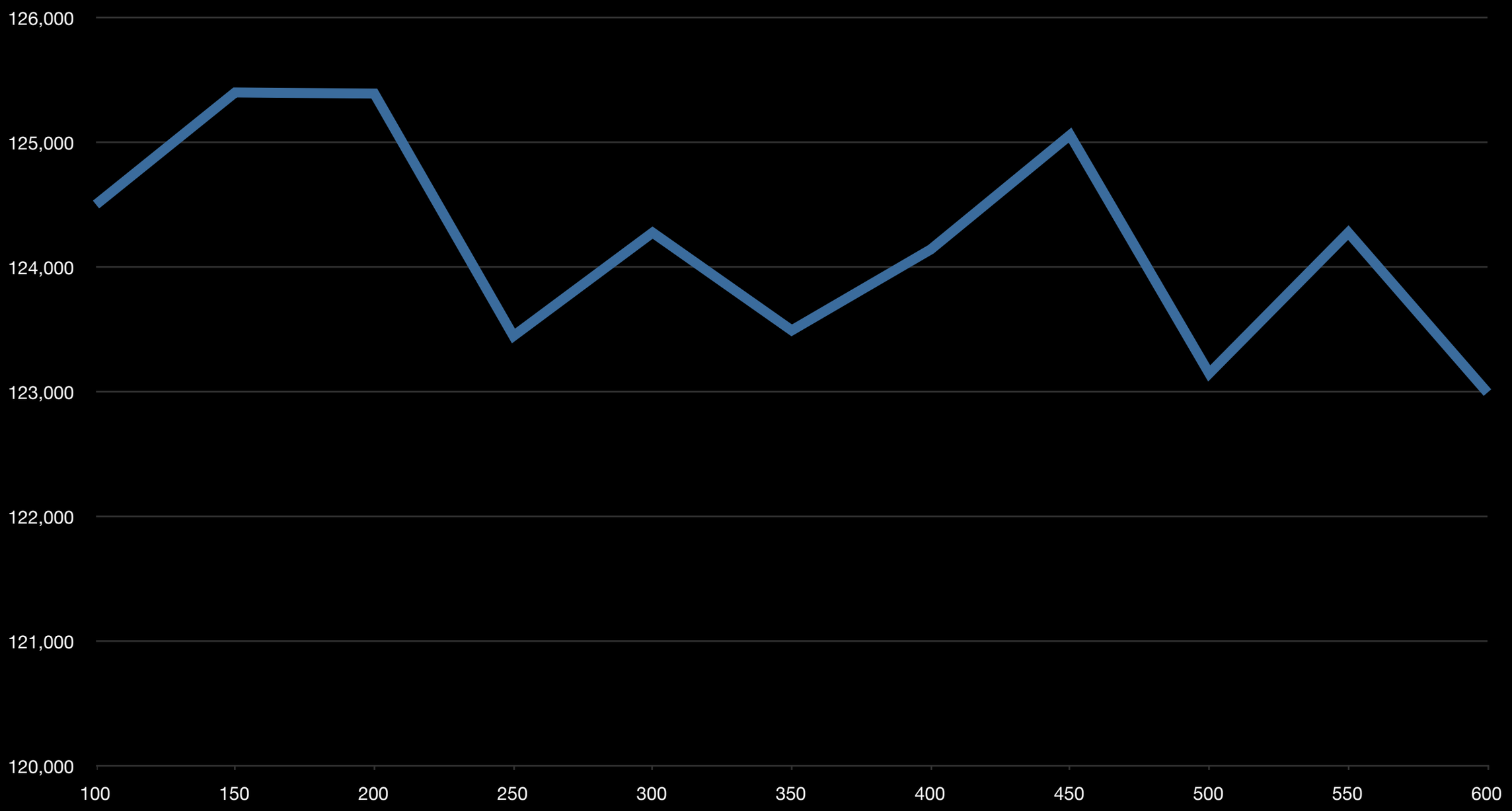
Parameter Exploration

- use baseline, vary one parameter
- length of tabu list: 0, 10 ... **50** ... 80
- iterations: 100, 200 ... **500**, 600
- # of searches: 10, 20 ... **40** ... 80
- neighborhoods: $2^{\{neighborhoods\}}$ **-** $\varnothing$

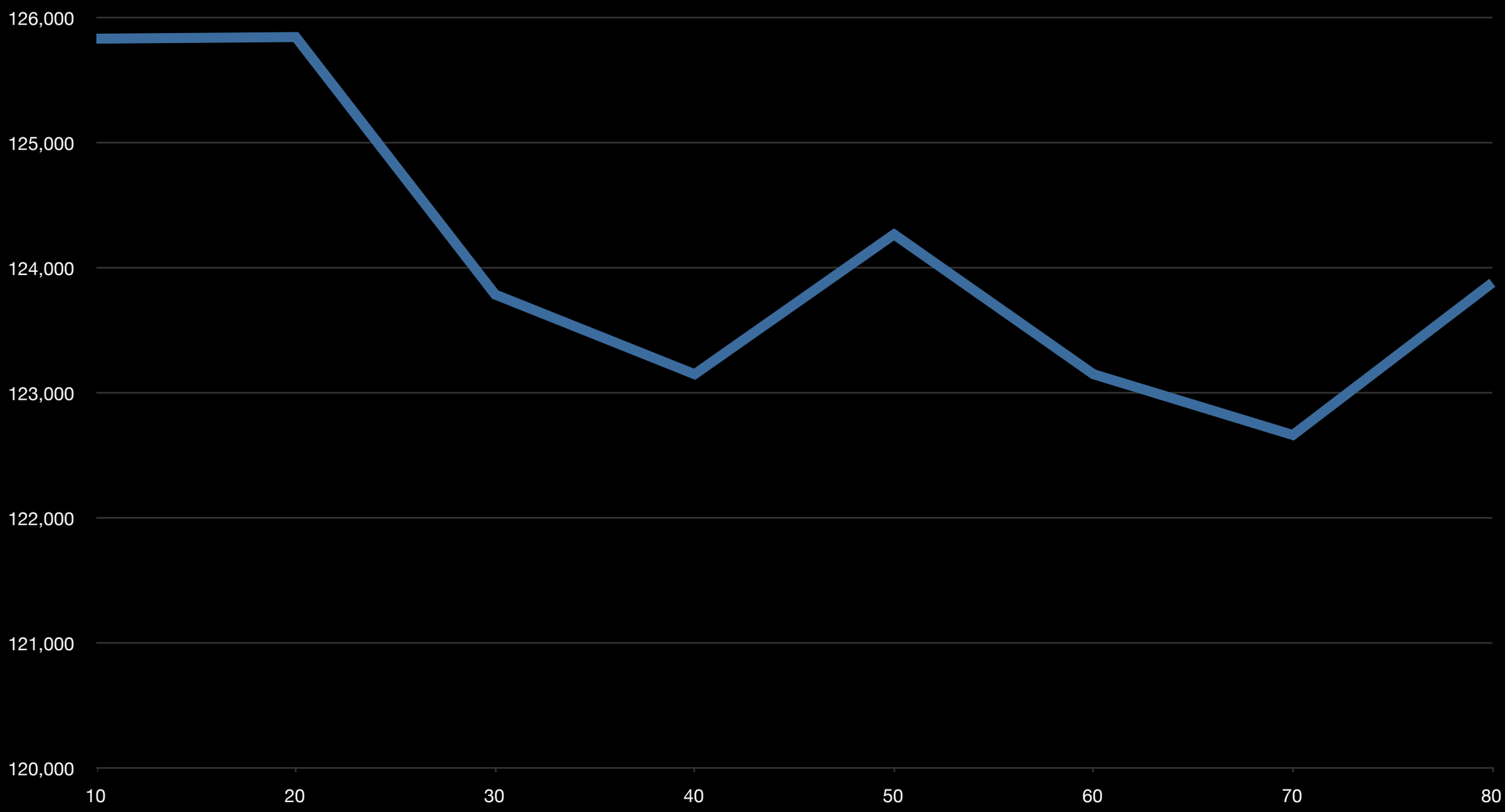
Tabu List Length - Cost



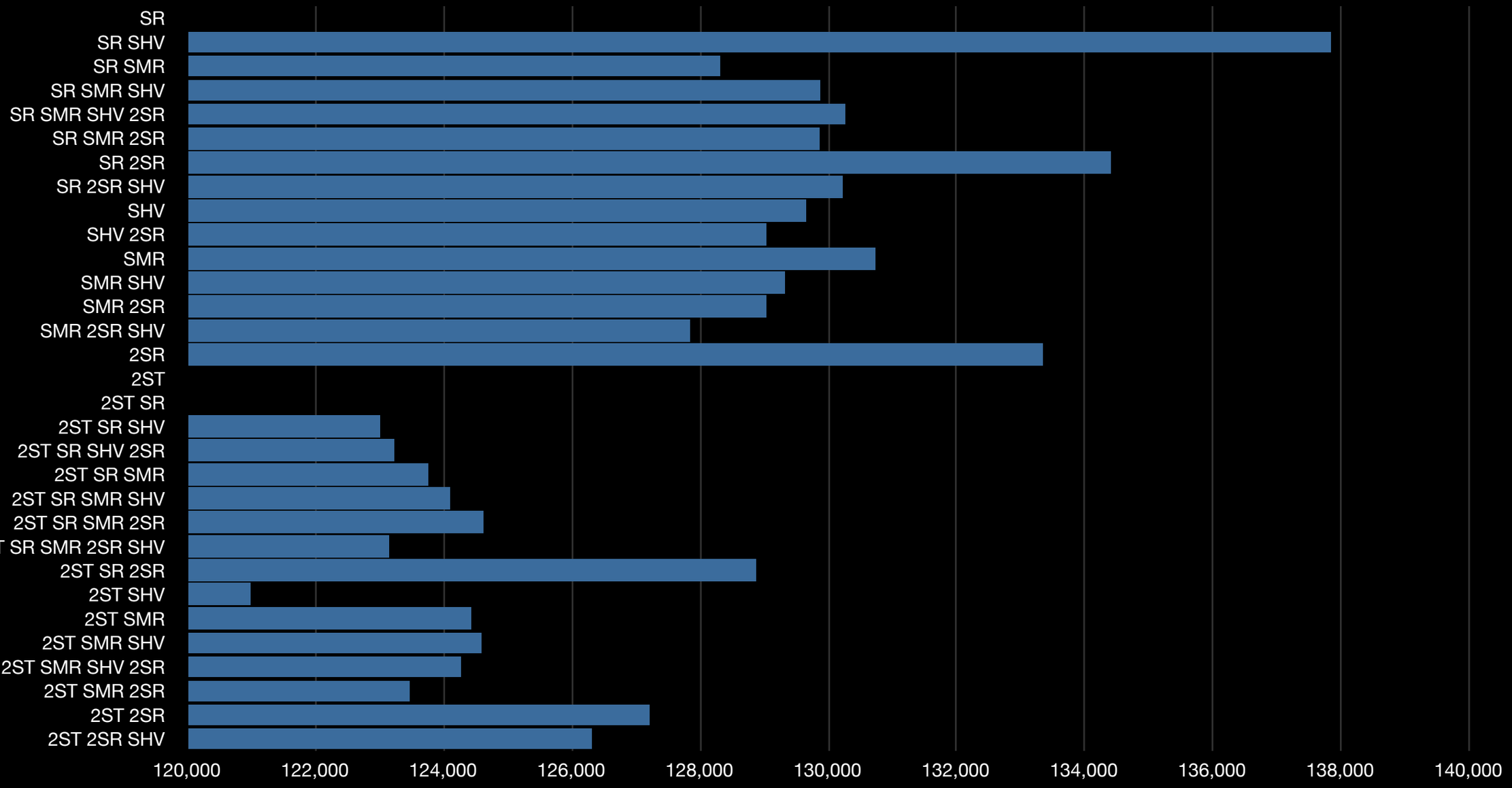
Iterations - Cost



Searches - Cost



Neighborhoods - Cost



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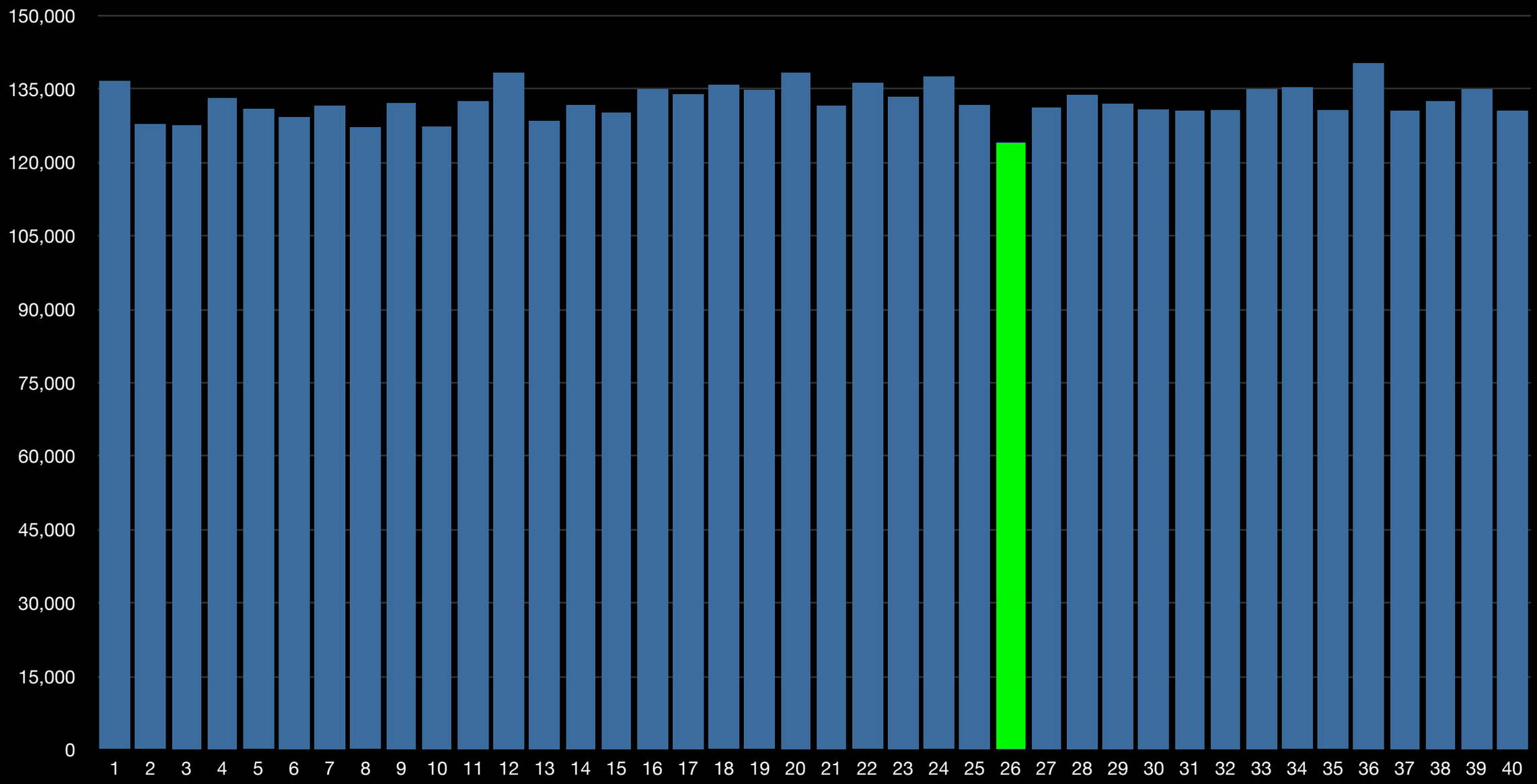
NLx Parameters

- Method: GRASP
- Construction Heuristic: GRASP, threshold 0.4
- Tabu-List Length: 70
- # Iterations: 10,000
- # Searches: 40
- Neighborhoods: all

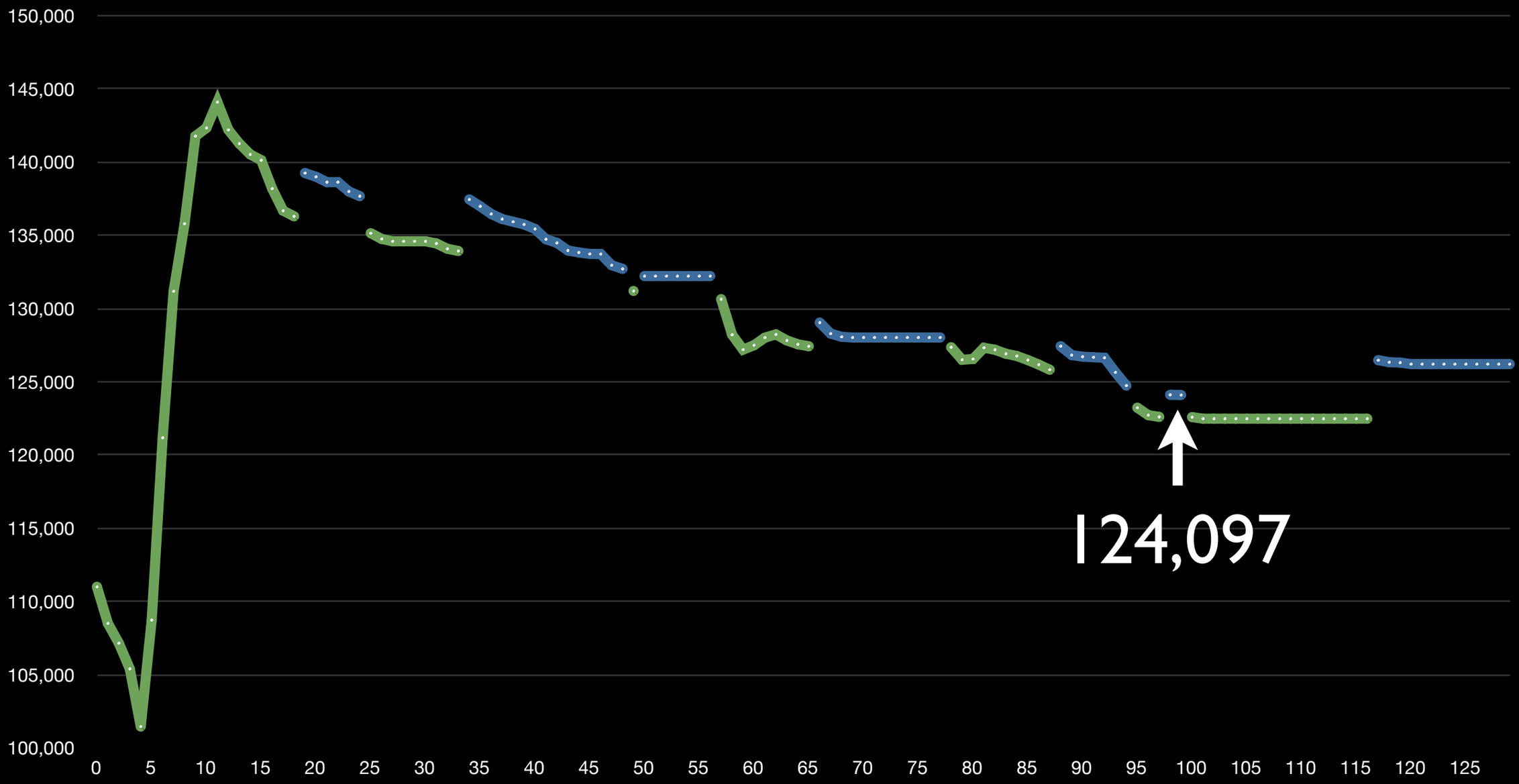
NLx Results

	min	max	avg	median
4	8,276	8,276	8,276.0	8,276.0
6	23,916	24,073	23,931.7	23,916.0
8	40,806	41,833	41,024.2	40,929.0
10	63,660	64,948	64,311.5	64,463.0
12	124,097	127,639	125,374.8	124,725.5

GRASP Run (NL12)



Tabu Search Run (NL12)



thanks for your attention

questions?

References

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